

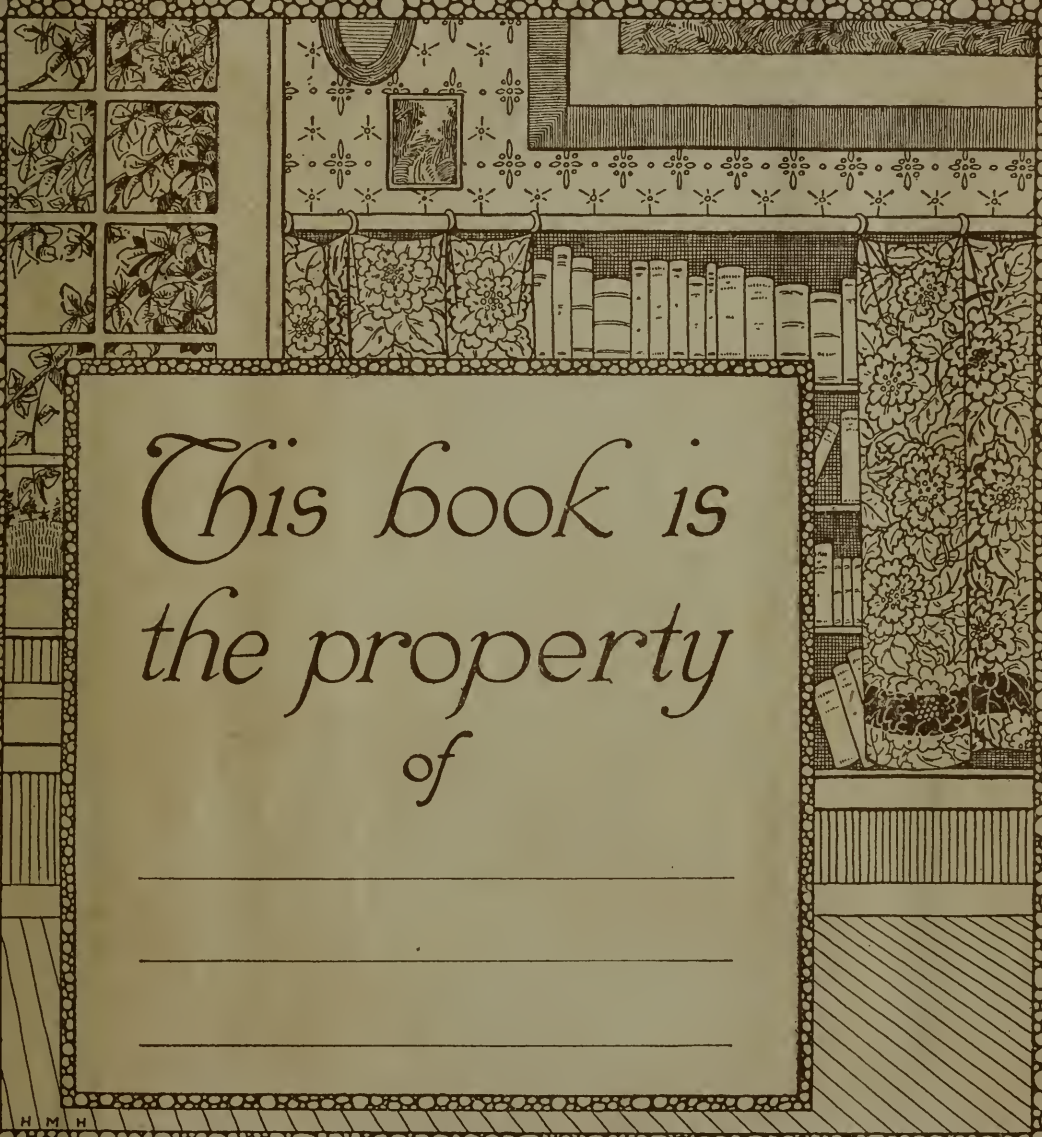
AMERICAN



*Education commences at the mother's knee,
and every word spoken within the hear-
ing of little children tends towards the
formation of character.*

—Ballou

EDUCATOR

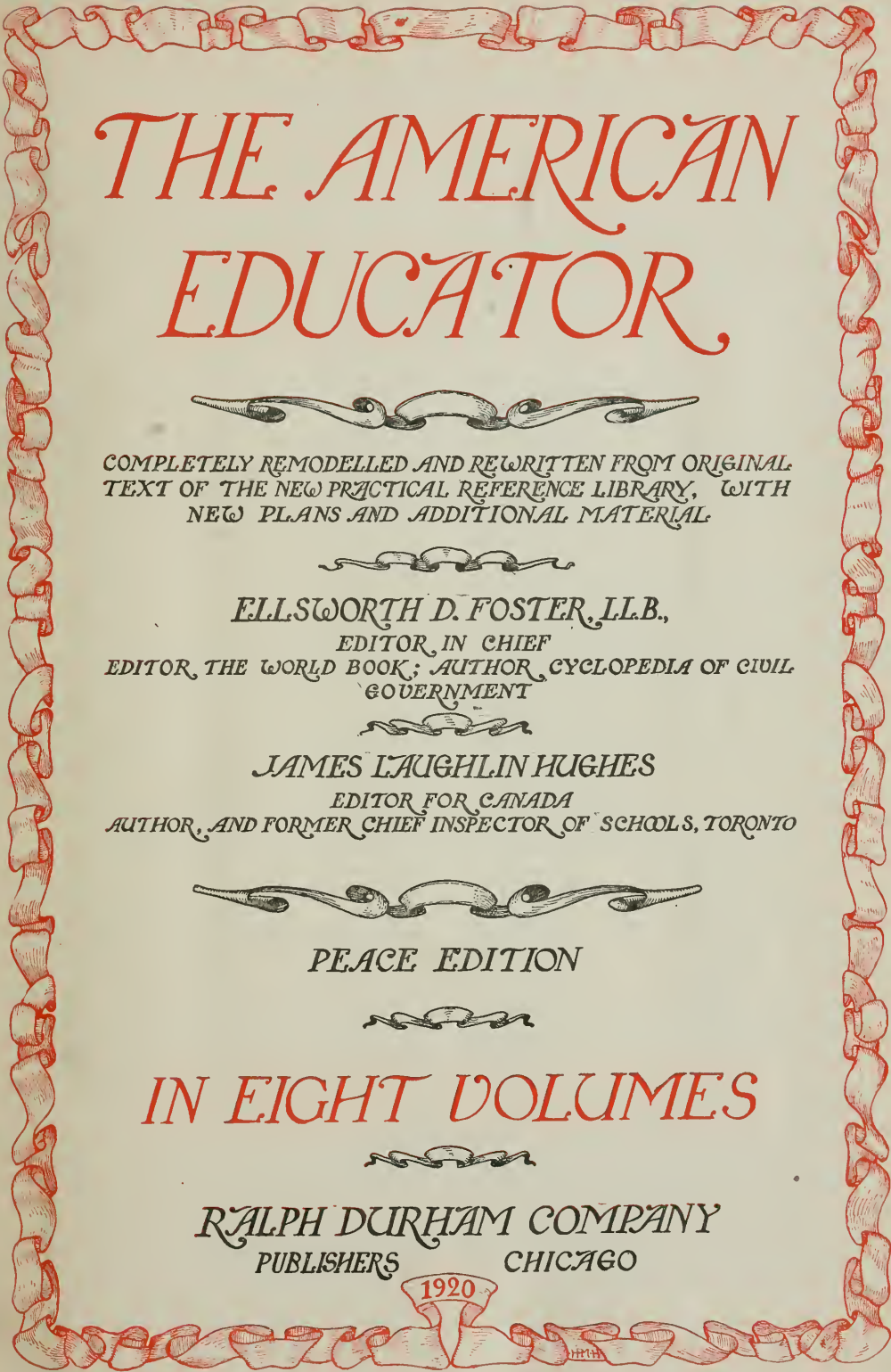


*This book is
the property
of*


*Knowledge is of two kinds. We know a
subject ourselves, or we know where
we can find information upon it.*
— Samuel Johnson




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THE AMERICAN EDUCATOR,




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ELLSWORTH D. FOSTER, LL.B.,
EDITOR IN CHIEF
EDITOR, THE WORLD BOOK; AUTHOR, CYCLOPEDIA OF CIVIL
GOVERNMENT



JAMES LAUGHLIN HUGHES
EDITOR FOR CANADA
AUTHOR, AND FORMER CHIEF INSPECTOR OF SCHOOLS, TORONTO



PEACE EDITION



IN EIGHT VOLUMES



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VOLUME SEVEN

SCHWATKA, *shwot'ka*, FREDERICK (1849-1892), an American Arctic explorer, born at Galena, Ill. He was graduated from West Point in 1871 and was occupied with garrison duty on the frontier until 1877. Meantime, he continued his studies and was admitted to the bar in Nebraska and received a degree in medicine in 1876. Two years later he started for the north polar region in search of Sir John Franklin and his party. After a journey fraught with great peril, he returned with evidence of the final destruction of the Franklin expedition. Later he explored the Yukon River in Alaska and also made several expeditions through unknown parts of Mexico. He has narrated his experience in three books, *Along Alaska's Great River*, *Nimrod in the North* and *Children of the Cold*.

SCIATICA, *si at'i kah*, neuralgia of the nerve trunk which passes down the back of the thigh, called the great sciatic nerve. It is caused usually by exposure, strain, pressure of constipation, and usually attacks persons subject to gout or rheumatism, but is sometimes a complication of spinal disease, diabetes and other disorders. Severe pain in the region of the hip is the chief symptom. If not properly treated sciatica tends to become chronic. Treatment includes rest, injection of medicine into the nerve and, in severe cases, local operation.

SCIENCE AND THE SCIENCES.

Science is a term derived from the Latin verb *scire*, meaning *to know*; therefore in the broadest sense of the term *science* means *knowledge*. But in the sense in which it is ordinarily used, it means knowledge gained through observation and study and organized by experience into a systematic whole. However, when we consider science in this light, we apply it to some branch of knowledge, which we call a *science*—such as the science of botany, or the science of ethics. In our study of science, then, we are dealing more with the *sciences* than with science in the abstract.

The ancient Greek philosophers, to whom we look for the first classification of sciences, had little difficulty in making their classifications. Aristotle, for instance, divided all

sciences into three classes—theoretical, practical and poetical, meaning by poetical, creative or technical sciences. But as knowledge was extended, a more complete classification of its various branches became necessary, and now we have almost as many sciences as there are branches of knowledge. We are inclined, however, to narrow our conception of the sciences to those branches of knowledge that pertain to the phenomena of nature, or to what we are pleased to call the natural sciences. Such a conception is too narrow, for we have sciences that deal with human conduct, as well as with phenomena of nature. Among such sciences are esthetics, ethics and civics.

The truly scientific investigator never jumps at conclusions; he never takes anything for granted. Unless the supposition under consideration is backed by sufficient evidence to warrant its acceptance, he lays it aside for further investigation. He works from his knowledge of the general law of cause and effect, knowing that under the same circumstances the given conditions always lead to certain results.

Related Articles. The following are the most important branches of science treated in these volumes:

Algebra	Mathematics
Anatomy	Meteorology
Anthropology	Mineralogy
Archaeology	Numismatics
Arithmetic	Oceanography
Astronomy	Paleontology
Biology	Philology
Botany	Philosophy
Calculus	Phonetics
Chemistry	Physical Geography
Economics	Physics
Ethnography	Physiology
Ethnology	Psychology
Eugenics	Sanitary Science
Geography	Sociology
Geology	Zoölogy
Geometry	

SCILLY, *sill'y*, ISLANDS, a group of about 140 small British islands situated at the entrance of the English Channel, about thirty miles from Land's End. Six islands are of some importance, the others being mere points of rock. The inhabitants are engaged in fishing and in the cultivation of flowers and vegetables. Population, 1911, 2,500.

SCIPIO, *sip'e o*, PUBLIUS CORNELIUS (237- about 185 B. C.), surnamed SCIPIO.

AFRICANUS THE ELDER, one of the most illustrious of Roman warriors. He took part in the battles of Ticinus and Cannae, in the first Punic War, and in 212 B. C. was unanimously elected aedile. The following year he became proconsul in Spain. His first enterprise of importance was the conquest of New Carthage, the stronghold of the Carthaginians in Spain. The next year (209) he totally defeated Hasdrubal, Hannibal's brother, and in 207 won a decisive victory over Mago and Hasdrubal, the son of Gisco. The result was to drive the Carthaginians from Spain, and Scipio was empowered to lead an army against Carthage itself. The Carthaginians recalled Haunibal from Italy, but the great Battle of Zama (202 B. C.) resulted in the total defeat of the Carthaginians. On his return to Rome, Scipio was honored with a triumph and received the surname of *Africanus*. After the successful close of a war with Antiochus, king of Syria, in 189 B. C., Scipio retired to private life. See **CARTHAGE**; **ROME**, **HISTORY OF**.

SCIPIO, PUBLIUS CORNELIUS AEMILIANUS (about 185-129 B. C.), surnamed **SCIPIO AFRICANUS THE YOUNGER**, a distinguished Roman general, a grandson by adoption of Scipio Africanus the Elder. In 151 B. C. he accompanied the consul, Lucius Licinius Lucullus, to Spain as military tribune, and two years later, on the outbreak of the Third Punic War, he commanded in Africa under Manius Manilius. His services were so important that in 147, although not of the legal age, he was unanimously chosen consul and leader of the forces against the Carthaginians. In 146 he took, and by command of the senate, burned, Carthage, for which he was honored with a triumph at Rome and with the surname of *Africanus*. In the last years of his life he engendered much enmity among the people by opposing the measures of the popular party, especially the agrarian law of Tiberius Gracchus.

SCISSORBILL, *siz'er bill*, or **SKIMMER**, a bird of the gull family, named because of its peculiar elongated, compressed bill, of which the lower mandible much exceeds the upper in length and shuts into the latter somewhat after the fashion of a knife blade into its handle. This beak is of an orange color at its base and black at its tip. The bird is found along the Atlantic coasts of America and Africa. It is often seen skimming along the water, thrusting the lower bill

into the water in its search for food. The general color of the bird is dark above and white below, with a band of white across its wings.

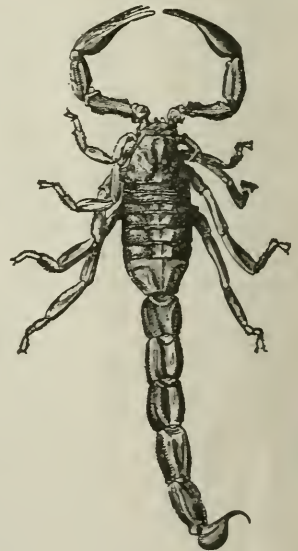
SCLEROSIS, *skle ro'sis*, in physiology, a hardening of the tissues in some part of the body. Hardening of the middle coat of an artery is a common form of sclerosis, and causes many deaths among city dwellers. It is frequently associated with heart and kidney diseases. Hardening of the normal tissue of the liver is called *cirrhosis*. Various nervous diseases, notably locomotor ataxia, result from degeneration of the tissue of the brain or spinal cord.

SCORPIO, *skor'pe o*, the eighth sign of the zodiac, the "accursed constellation," considered by astrologers to exercise a baneful influence upon human destinies. In ancient astrology the symbol (♏) was meant to represent the arrow-shaped sting of the scorpion. This constellation is attended at its setting by tempests and autumnal diseases.

Related Articles. Consult the following titles for additional information:

Aries	Orion
Astronomy	Zodiac

SCORPION, the name of a group of animals belonging to the same class as the spiders. They live in tropical and warm temperate regions, and are not found in America north of Nebraska. In the southern part of the United States there are about twenty species. The body consists of two parts, one containing the head and thorax and called the *cephalothorax*, and the other a long, jointed abdomen, the last five segments of which form a tail. Four pairs of legs and two pairs of mandibles or pincers are attached to the cephalothorax; the second pair of pincers resemble a lobster's claws.



SCORPION

The abdomen contains breathing pores and the last segment of the tail is armed with a sharp poisonous sting, the poison being secreted by two glands at its base. The eyes vary in number from six to twelve, according to the species. Scorpions are usually black or yellowish in color. The young are carried on the body of the mother for several days after birth. They cling to her body by the pincers.

Scorpions remain hidden in crevices and under rocks by day, and are active at night. They feed upon insects and spiders, and are dreaded by man because their sting causes a serious and painful wound, though it is seldom fatal. The poison should be sucked from the wound as soon as possible, and the wound bathed with ammonia, which should be also taken internally.

SCORPION FISH, a genus of fishes belonging to the gurnard family. The *red scorpion fish* is a familiar form. The *spotted scorpion fish* is a second species, and, like the preceding, is native to British waters as well as in the Mediterranean, the Atlantic, and the tropical seas. Another species is the common market fish of Southern California, measuring a foot in length and colored brown and olive.

SCORPION FLY, an insect related to the dragon fly. The name *scorpion fly* is derived from the appendages attached to the abdomen of some species. The male in the common species, for example, has the sixth and seventh joints of the abdomen attenuated and capable of extensive motion, while the last joint forms a pair of forceps, resembling those of the earwigs. When at rest this tail is curled over the back, but when irritated the forceps are used as weapons of offense or defense.

SCOTCH TER'RIER, a small dog weighing from fourteen to twenty pounds, with a long head, dark eyes and upright ears. The hair is rough and coarse, and may be black, reddish, brindled or sandy. The tail is carried erect. The dogs are intelligent, gentle and active and in demand as pets.

SCOTCH VERDICT In American courts a person who is tried for an alleged offense before a jury meets with a verdict of "guilty" or "not guilty." In Scotland, in cases where the evidence is not conclusive in either of the above directions, the jury may return the verdict, "not proven." The accused must then be freed.

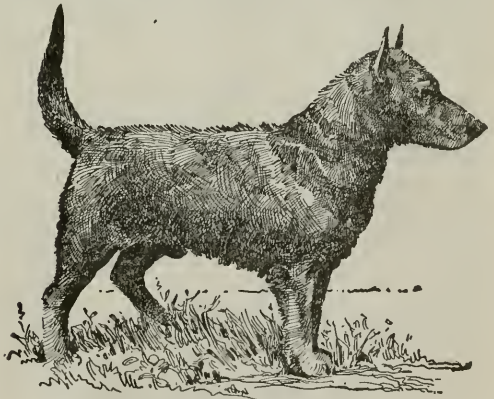


SCOTLAND, the political division of the United Kingdom occupying the northern part of the island of Great Britain, and including the Hebrides, Orkney, Shetland and other islands. It is separated from England by the Cheviot Hills and Solway Firth. Scotland is the Caledonia of the Romans, a land of irregular coasts and rugged surface; of beautiful lakes and hardy people; the land of which Scott sang:

O Caledonia! stern and wild,
Meet nurse for a poetic child!
Land of brown heath and shaggy wood,
Land of the mountain and the flood.

Scotland's wild beauty, warring factions and devoted heroes have been celebrated in legend, poetry and song until the country is known wherever the English tongue is spoken.

Location and Size. With the exception of the boundary separating it from England Scotland is surrounded by the sea. The coast line is very irregular and has an extent of 2,300 miles. The most northerly point of the mainland is in about the same latitude as Petrograd, the southern point of Greenland and the southern coast of Alaska. The greatest length from northeast to southwest is 287 miles, and the breadth varies from less than thirty to 140 miles. The area, in-



SCOTCH TERRIER

cluding islands, is 30,404 square miles, or a little less than that of South Carolina. On the eastern coast the most prominent inden-

tations are Moray Firth, the Firth of Tay and the Firth of Forth, while on the south and west are Solway Firth, the Firth of Clyde, the Firth of Lorne, the Sound of Sleat and Loch Broom. With the exception of the sound, each of these indentations terminates in an estuary.

The People. About one-tenth of the inhabitants of the United Kingdom live in Scotland. The native inhabitants are known as Scots or Scotch. Those occupying the northern portion of the country, particularly the highlands, are of Gaelic descent, and among them the Gaelic language is still spoken, though most of the younger people have learned the English (see CELTS). The southern portion of the country contains a large number of people of English descent. The Scotch are a hardy race, known the world over for their integrity, industry and thrift. The Highlanders are the tallest people in the world, averaging from five feet eight inches to six feet in height. They still retain their ancient style of dress, with the kilt and the plaid for special occasions, and the bagpipe still awakens the echoes of hill and glen. The clan or tribe which has played so conspicuous a part in their history continues to be important in social life. The highland regions are sparsely settled, but in the lowlands the people have gathered in large cities and towns, and the movement city-ward is increasing. In this part of the country fully three-fourths of the inhabitants dwell in cities, of which Glasgow, with 784,500 inhabitants; Edinburgh, about half as large, and Aberdeen and Dundee, each having a population of about 160,000, are the most important.

In religion the larger part of the population are followers of the Presbyterian faith, though other Protestant churches have considerable following, and in the larger cities the Church of England is maintained, but neither this Church nor the Roman Catholic Church has as numerous a following, in proportion to the number of inhabitants, as in England or Ireland.

Surface and Drainage. The surface of Scotland is divided naturally into three divisions—the highlands, occupying the northern portion of the country; the central lowlands, immediately southeast of the highlands, and the southern uplands, which include the southern counties. The highland region, which embraces fully one-third of

Scotland, is noted for its numerous mountains and hills, the highest of which are the Grampian Hills, containing steep precipices and narrow valleys through which flow rapid streams or in which lie deep and clear mountain lakes. The highest elevation in this region and in Great Britain is Ben Nevis, which attains an altitude of 4,406 feet.

The central lowlands differ from lowlands in most other countries in being widely diversified by low hills, beautiful valleys and numerous lakes and streams. This region and the highlands have for centuries been famous for their beautiful scenery, and it was this portion of Scotland that Scott immortalized in his poems, *Lady of the Lake*, *Lay of the Last Minstrel* and *Marmion*, and in a number of his novels (see SCOTT, WALTER, Sir). In the southern uplands are found numerous ranges of low mountains, one of which, the Cheviot Hills, forms a portion of the boundary between Scotland and England. Another range extends southward into England. These are low mountains, and the highest peaks do not attain an altitude of 3,000 feet, but a number reach a height of 2,700 feet or over. The surface in this part of the country is less broken and irregular than in the highland region.

The most important streams flow to the east and enter the North Sea. The largest of these is the Tweed, and others worthy of mention are the Forth, the Tay, the Dee, the Don, the Spey and the Findhorn. Those entering the sea on the west are the Clyde, the Ayr, the Doon, the Dee, the Nith, the Annan and the Esk. The Tay has the greatest volume of water, but the Clyde has been canalized and thus made navigable for ocean ships as far as Glasgow. This renders it by far the most important commercial waterway of Scotland. The country is noted for its large number of beautiful mountain lakes. Among the most noted of these are Lomond, Katrine, Tay, Earn, Rannoch, Awe, Shiel, Ness and Maree, in the western and northern highlands, Leven in the central lowlands, and Saint Mary's Ken, Dee and Doon, in the southern uplands.

Climate. See GREAT BRITAIN.

Mineral Resources. The southern portion of Scotland is rich in minerals. By far the most important of these is coal, which is mined in large quantities in the County of Lanark, in which Glasgow is situated. Iron ore is found in the County of Ayr, to the



MAP OF SCOTLAND

west of the coal fields. Shale rock, which yields large quantities of shale oil, is extensively quarried in Linlithgow County. Granite, limestone, slate, clay and lead are also produced in paying quantities.

Fisheries. Surrounded, as it is, by cool waters and dotted with a large number of cold, clear streams and lakes, Scotland abounds in fish, and the taking of them constitutes an important industry of the people.

The annual catch is valued at about \$15,000,000. The varieties taken in largest quantities are herring, haddock and cod. Steam trawlers are replacing the sailing vessels, and this change is forcing most of the private fishermen out of business, since they do not have the capital to compete with the large boats owned by companies which now control the salmon, whale and seal fisheries. The value of the fisheries for 1917, exclusive of salmon, was \$17,751,000.

Agriculture. Its rugged surface, barren soil and cool climate render a large part of Scotland unsuitable for agriculture. In the lowlands all available land is tilled, and in the highlands and upland regions much of the country is devoted to stock raising. The highlands are well adapted to sheep, and the wool produced is of considerable value. Among the important crops are oats, barley, turnips, potatoes and hay. Forage crops are also raised for fodder. The country is known for its excellent breeds of cattle, among which are found the Ayrshire, the Jersey, the polled Angus and the Galloway (see CATTLE). Scotland is also the home of the Clydesdale horse.

Manufactures. The manufactures are important and furnish occupation for fully one-fourth of the inhabitants. The most important manufacturing industries are those producing woolens, cottons and linens. These are followed by the iron and steel industries, whose center is at Glasgow; along the Clyde are found the largest shipyards in the world. Here were built the great ships of the Cunard line, and some of the most famous yachts of the world. The Clyde yards were the center of shipbuilding for the British Empire during the World War. Glasgow is also noted for its manufacture of chemicals, and throughout the country are found breweries and distilleries, some of which have become famous for their products. Edinburgh is noted as one of the great publishing centers of the English-speaking world. In other localities sugar refining and the manufacture of paper, glass, gloves, hosiery and various small wares give employment to a large number of people.

Transportation and Commerce. See GREAT BRITAIN, subhead *Transportation and Commerce*.

Education. The public education system of Scotland was reorganized by an act of Parliament passed in 1918. Central administration is under the control of the Scotch Edu-

cation Department, which is empowered to establish an advisory council consisting of not less than two-thirds of its membership. The duty of the council is to advise and make recommendations to the department. The counties and the five large burghs act as education authorities administered by boards elected by local government units. The bill also provided for the establishment of nursery schools for children between the ages of two and five, and made school attendance compulsory between the ages of five and fifteen. No exemptions may be granted to pupils below the age of thirteen. Restrictions on the employment of children are rigid.

There are several endowed schools and schools under private management which give high school instruction. Universities are maintained at Saint Andrew's, Glasgow, Aberdeen and Edinburgh. These are aided by government grants and by funds contributed by Andrew Carnegie. Much attention is given to technical instruction, and at Glasgow is the Royal Technical College, the largest school of its kind in the British Empire.

Government. The Local Government Board for Scotland, for the administration of local affairs, was created in 1894. It consists of the Secretary for Scotland, the Governor-General, the Undersecretary and three other members appointed by the sovereign. The counties and parishes are administered by councils, and burghs or town by municipal boards, provosts and bailies.

For the central government, see GREAT BRITAIN, subhead *Government*.

Language and Literature. Down to the fifteenth century the term *Scottish language* meant the Gaelic, or Celtic, tongue, while the language of lowland Scotland was looked upon as English. Such it really was—Northern English, with certain peculiarities of its own. The term *Scottish* came to be applied to it as possessing these peculiarities and as having a somewhat distinctive literary use. This language has been divided into three periods. During the *early* period, extending to the end of the fifteenth century, there was little difference between the language of Scotland and that of England north of the Humber. In the *middle* period, which extended to the Union, it was influenced in a slight degree by the Gaelic, and in a more pronounced manner by French and Latin, consequent on the French alliance and the re-

vival of learning. During the *modern* period, it has been to a considerable extent affected by modern literary English, though the genuine vernacular may still be heard in many districts.

The *Sir Tristram*, a metrical romance dating from the end of the thirteenth century, doubtfully attributed to Thomas the Rhymer, is by some regarded as the earliest piece of Scottish literature, but the first undoubted specimen of Scottish literature is the *Bruce* of Barbour (about 1375). Down to the middle of the sixteenth century four names stand out prominently, namely, Henryson, Dunbar, Gavin Douglas and Sir David Lindsay. Then, with the exceptions of Alexander Scott, Arbuthnot, Rolland of Dalkeith, Sir William Alexander and Drummond of Hawthornden, about a century and a half elapsed before any eminent poet arose. In the third period of the language the first notable name is that of Allan Ramsay (1686-1758), author of *The Gentle Shepherd* and of numerous shorter pieces and songs. To this same age belongs also nearly the whole of that remarkable body of song known as the Jacobite minstrelsy. The most prominent Scotch writers, aside from those mentioned, are Fergusson, Robert Burns, Hector MacNeill, Sir Walter Scott, James Hogg, Robert Tannahill, Joanna Baillie, George MacDonald, Robert Louis Stevenson, John Watson and J. M. Barrie. Besides these there is a long list of philosophers, legal writers and physicians, such as Adam Smith, Barclay and Liddell.

History. The part of the island of Britain which lies north of the Firth of Forth and the Clyde was known by the Romans from the first century A. D. as Caledonia. The name Scotia (Scotland), limited in the early periods to Ireland, was used from the tenth century on for a part of Scotland, and after the thirteenth century it was applied to the present realm of Scotland. The oldest inhabitants of the country were the Picts. When the Romans, during the time of the emperor Claudius, conquered the southern part of Britain, the northern part, Caledonia, remained independent. When Agricola was in Great Britain he made several incursions into Caledonia and won some victories, but after his recall these advantages were lost by the Romans. As a protection on the north for their British territory, the Romans during the time of Emperor Hadrian

built a wall between the Firth and the Tyne. Under Antonius Pius a second wall was built farther north. In spite of these fortifications, however, Britain was constantly, after the third century, disturbed by invasions of the Picts. About the middle of the fourth century, the Scots, who had come from Ireland and settled in the northwestern part of Caledonia, began to take part in these invasions.

The history of Scotland during the time of the Anglo-Saxon conquest of Britain is enveloped in mystery. In the seventh century, when we again have historical accounts of the country, it is found divided into four kingdoms, those of the Scots, the Picts, the Britons and the Saxons. About the second half of the sixth century, Christianity had been introduced among the Picts, and the Scots had brought Christianity with them from Ireland. In 843 the king of the Scots, Kenneth, made himself ruler also of the Picts, and the kingdom thus formed was known for a time as Alban and later as Scotland. Early in the ninth century, Scotland began to be disturbed by the Danes and the Normans, who had made invasions of the country and had formed settlements on the islands about the coast.

The last king who was descended from Kenneth was Malcolm II. He was followed by Duncan, who was killed in 1040 by Macbeth. Malcolm III, known as Malcolm Canmore, the son of Duncan, defeated Macbeth and slew him, in 1057. When England was conquered by the Normans, in 1066, Malcolm took the part of Edgar Atheling, the legitimate ruler, and gave asylum to many of the Anglo-Saxon nobles. He was for this reason involved in long conflicts with William the Conqueror and was at length obliged to submit and do homage for his kingdom. The most noteworthy of the sons of Malcolm was the youngest, David I (1124-1153), who introduced into Scotland feudalism as it was in practice in England. David's grandson and successor, Malcolm IV, was unable to maintain in full the power which David had gained.

William the Lion (1165-1214), by reason of his claims on territory in the northern part of England, came into conflict with Henry II of England, was taken captive at Alnwick in 1174 and received his freedom only on taking the oath of allegiance to the English king. William was followed by his son Alexander, who, taking advantage of the disturbed con-

dition of England under John, invaded that country, was defeated and was compelled to do homage to the English king. Alexander III, by his defeat of the king of Norway, added to the kingdom the Isle of Man and the Hebrides.

After the death of Alexander and that of his granddaughter, Margaret, called the Maiden of Norway, numerous pretenders to the crown arose, among whom the most powerful were John Baliol and Robert Bruce. Edward I, chosen as arbiter between these two claimants, decided in favor of Baliol, who then in turn swore allegiance to the English crown. When Edward made his overlordship too oppressive, Baliol attempted with the help of France to make Scotland independent; but Edward invaded Scotland, and after a victory at Edinburgh he took Baliol to England with him as a prisoner. Scotland was now ruled by an English regent. Resistance under William Wallace was for a time effectual, and a great victory was gained at Stirling in 1297. Eight years later, however, Wallace, deserted by the Scotch nobles, was defeated and taken prisoner. Another popular leader was found in Robert Bruce, who declared himself king of Scotland, as Robert I, and in 1314 completely defeated an English army under Edward II at Bannockburn. For fourteen years from this date, Scotland was practically independent. Robert's son, David II, who succeeded him, was a minor, and new disturbances at once began in Scotland. War broke out with England in 1333, and after the Battle of Halidon Hill (1333) and that of Neville's Cross (1346), the Scottish kings were obliged to do homage to England.

With the accession of Robert II in 1371 began the Stuart dynasty. The kings of this line were for the most part strong and able men, but the fact that many of them came to the throne during their minority allowed the nobles to gain undue prominence. James I (1406-1437), who had been taken prisoner by the English before his father's death, was not allowed to return to Scotland until 1424. He proved, on gaining the authority, to be a man of much strength of character, and he introduced order into his kingdom, put down the nobility and greatly encouraged commerce and industry. James IV (1488-1513) became involved in a war with England on account of his support of the pretender, Perkin Warbeck, but soon concluded a truce, and married, in 1503, the daughter of Henry VII

of England. However, after the accession of Henry VIII to the English throne, James, who had formed an alliance with France, invaded Northumberland, but was defeated and killed at the Battle of Flodden Field.

The king's death plunged the nation into a state of anarchy; his successor, James V, had not yet reached the age of two years. His cousin, the Duke of Albany, was appointed regent, but from an early part of the reign James was almost entirely in the hands of the earl of Angus, who had married the queen dowager and had almost complete control of affairs till 1528, when James, then in his seventeenth year, managed to escape to Stirling, take the government into his own hands and drive Angus into England. His alliance was sought by England, France and Spain, and in 1537 James married the daughter of Francis I. The young queen died a few weeks after her arrival in Scotland, and in the following year James married Mary of Lorraine, daughter of the Duke of Guise. Henry VIII made several attempts to induce James to join the Reformation, but James remained a supporter of the old faith as against the reform doctrines.

The eventful period which followed the accession of Mary was dominated by the Reformation movement and by the questions affecting the union of Scotland and England. A scheme to marry the young queen to Edward, son of Henry VIII, was defeated, and the old league with France was renewed.

James VI, the son of Mary, was but a child, and a succession of regents governed the kingdom. On the death of Elizabeth of England, in 1603, James succeeded to the throne as the nearest heir, through his descent from Margaret, daughter of Henry VII and wife of James IV.

There were seven Scottish Parliaments called by James after his accession, wherein he was represented by a commissioner sitting as president. His chief energies were directed to an attempt to draw England and Scotland into a closer union, by means of harmonizing the laws of the two countries and by establishing episcopacy in Scotland. In furtherance of the latter object he visited Scotland in 1617 for the only time after the union of the crowns. There were many acts passed for promoting trade and commerce, and the nation about this time seems to have been seized with a mania for colonization, as many thousands of the inhabitants

left their native land for the Irish province of Ulster or the more distant shores of Nova Scotia. James died in 1625 and was succeeded by his son, Charles I.

Foreign wars and domestic troubles prevented Charles from visiting Scotland till 1633, when he was crowned at Edinburgh. The church was now entirely governed by the bishops, and civil affairs were managed by the privy council. At the outbreak of the civil war in England, Scotland took the part of the Parliament against the king, the Solemn League and Covenant being entered into between the Scottish Presbyterians and the English Parliament.

After the execution of Charles, in 1649, the Scots proclaimed his son king, under the title of Charles II. The young king was then in Holland, and commissioners were sent over from Scotland to inform him that the governing body was willing to join his cause if he would take the covenant. This Charles agreed to do, and he was invited over to his northern kingdom. He arrived in Scotland, was crowned at Scone in 1651 and immediately marched into England. Cromwell, who had already defeated him once in Scotland, followed, and at Worcester utterly scattered the royalist force and compelled Charles to become a fugitive (September 3, 1651). Cromwell returned to Scotland for a time, and on his departure for England he left Monk to complete the work. Cromwell's death was followed by his son's fall, Monk's march to London at the head of the army and the restoration of Charles II (1660). It soon became apparent that Charles was determined to carry out the favorite scheme of his father and grandfather, of establishing the episcopacy in Scotland. This attempt was violently opposed and led to a cruel persecution, which lasted with more or less severity during the whole of the reign of Charles. Hundreds were executed; others were fined, imprisoned and tortured, and whole tracts of the country were placed under a military despotism of the worst description. Under James II the chief events of Scotland were the rising, defeat and execution of Argyll; the declarations of indulgence by which many of the Presbyterian ministers returned to their charges, and the continued persecution of the strict Covenanters. At the Revolution of 1689, William, James's son-in-law, and Mary restored religious freedom.

The death of William III in 1702 transferred the crowns of the two nations to Queen Anne, sister of Mary. In 1703 the Parliament of Scotland issued a declaration which showed an intention, in case of the death of the queen, to appoint a different sovereign from the English king, and the ill feeling between the two countries grew so strong that English statesmen became convinced that a union was essential for the peace of the two countries. A joint commission was appointed to draw up articles of union in 1706. In the Scottish Parliament the articles encountered a strong opposition, but a majority finally carried the measure in January, 1707. Thenceforth the history of Scotland is identified with that of Great Britain. Scotland furnished its full quota of troops in the World War, and bands of Highland troops in their kilts performed some of the most daring feats of the war. A regiment of Scotch Canadians so impressed themselves upon the foe that they won from the Germans the name "Ladies of Hell." See GREAT BRITAIN, subhead *History*.

Related Articles. Consult the following titles for additional information:

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Hebrides	Shetland
Orkney	
LAKES	
Katrine	Lomond
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SCOTLAND YARD, a group of buildings in London, England, long famous as the headquarters of the city police force. It is situated at the southeast corner of Charing Cross and takes its names from a palace formerly reserved for the entertainment of Scottish kings when visitors to London. Since 1891 the police department has occupied buildings on the Thames Embankment, known as the New Scotland Yard. The name occurs prominently in English detective stories.

SCOTT, HUGH LENOX (1853-), a retired chief of staff of the United States army. He was born at Danville, Ky. For several years after his graduation from West Point he led expeditions against the Indians. He served successively as adjutant-general of Cuba; governor of the Sulu Archipelago (Philippines), from which islands he abolished slavery; and with the rank of colonel, superintendent and commandant at West Point. In 1913, as brigadier-general, he was placed in command of a brigade of cavalry stationed along the Mexican border. Scott showed great ability in settling difficulties by diplomatic efforts, as was evident in the skill with which he pacified a lawless band of Piute Indians in Utah and in dealing with the Villa faction in Mexico. In 1915 he was advanced to the grade of major-general, and from November, 1914, to September, 1917, was chief of staff. After serving on the United States Commission to Russia, headed by Elihu Root, he was appointed commander of the 78th Division at Camp Dix, N. Y., receiving command in March, 1918.

SCOTT, ROBERT FALCON (1868-1912), a celebrated English naval officer and Antarctic explorer, who shares with Amundsen the honor of having reached the South Pole. He was born at Outlands, Devonport, and was educated at Stubbington House, Fareham. In 1882 he entered the navy and rose in eight years to the rank of commander. In 1901 he led an expedition to the south polar regions, where he remained until 1904. On his return to England he was promoted to the rank of captain in recognition of his achievement. In 1909 he was appointed to command the British Antarctic Expedition, whose object was to make extensive investigations in the polar regions and also to locate the South Pole. Scott and four companions reached the Pole on January 18, 1912, but on his return trip lost their lives from



ROBERT F. SCOTT

exposure in a terrific blizzard. The fate of Captain Scott and his companions as recorded in their diaries, will always remain one of the most glorious and most tragic in the history of exploration and discovery. See **SOUTH POLAR EXPLORATION**.

Grave, at
Dryburgh Abbey

SCOTT, WALTER, Sir (1771-1832), a Scotch poet and novelist to whom is credited the creation of the historical novel. He was born in Edinburgh, entered the high school there in 1779, and in October, 1783, was matriculated at the University of Edinburgh. However, neither at school nor at college did he manifest special ability. At the age of sixteen he began

in his father's law office a term as apprentice, and in 1792 became a member of the Scottish bar. In 1797 he married Charlotte M. Charpentier, the daughter of a French refugee. Two years later he was appointed sheriff of Selkirkshire, and in 1806 became a principal clerk of the Court of Session.

Scott, the Poet. Scott's first ventures in literature were a translation of Bürger's *Lenore*, and *The Wild Huntsman*, which he published in 1796. Then followed the ballads of *Glenfinlas*, *The Eve of Saint John* and the *Grey Brother*; a translation of Goethe's *Götz von Berlichingen*; the three volumes of the *Minstrelsy of the Scottish Border*, and an edition of the old metrical romance of *Sir Tristram*. In 1805 he became prominent as an original poet, with the publication of the *Lay of the Last Minstrel*, an extended specimen of the ballad style, which became widely popular. In 1808 he published *Marmion*, another poetic romance, which greatly increased his reputation. In 1810 the *Lady of the Lake* appeared, in which his poetical genius seems to have reached its height. His subsequent poetical productions, *The Vision of Don Roderick*, *Rokeby*, *The Bridal of Triermain* and *The Lord of the Isles*, were not so widely acclaimed.

Scott, the Historical Chronicler. Upon the decline of his popularity as a poet, and realization that Byron was surpassing him in his own field, Scott turned his attention to the prose romance, for which the greater part of his early life had been a preparation. The appearance of *Waverley* in 1814, forms an epoch in modern literature as well as in the life of Scott. This romance was rapidly followed by the series known as *The Waverley Novels*, which comprises such masterpieces of historical fiction as *Ivanhoe*, *Guy Man-*

nering, *The Heart of Midlothian*, *The Bride of Lammermoor*, *The Legend of Montrose*, *The Monastery*, *Kenilworth*, *Quentin Durward* and *The Talisman*. Among these, the novels dealing most intimately with Scottish life are counted among his best.

Scott, Man of Business. The desire to become an extensive landed proprietor and to found a family was always one of Scott's ambitions, and this he began to gratify in 1811 when he purchased a small farm of about 100 acres lying on the south bank of the Tweed. By degrees, as his resources increased, he added farm after farm to his domain, until he had completed the estate to which he gave the name of Abbotsford, the "romance in stone" (see page 2).



SIR WALTER SCOTT

In 1820, when he was made a baronet by George IV, he reached the zenith of his fame and material prosperity. But this prosperity was founded on no solid basis, and the crash came in 1826, when Constable & Co., Edinburgh publishers, were obliged to suspend payment, hopelessly involving Ballantyne & Co., with whom it then appeared that Scott was a partner. The liabilities thus incurred by him amounted to about \$600,000. Although he might have compromised with his creditors, Scott assumed this sum as a personal obligation. He worked like a galley slave to clear off the debt, his novels and historical writings following each other with incredible rapidity. Within two years he was able to pay his creditors \$200,000. *Woodstock*, *The Fair Maid of Perth*, *Anne of Geierstein*, *A Life of Napoleon* (nine volumes), were a few of the works which flowed quickly from his pen between 1826 and 1831.

The strain was too great, however, and in 1830 Scott had an attack of paralysis, from which he never fully recovered. A trip to Italy did him little good, and he returned to Abbotsford to die. He was buried in his family burial aisle, amidst the ruins of Dryburgh Abbey. Some years after his death his debt was entirely liquidated by the sale of copyrights and the constantly-increasing sale of his works.

The biography of Scott written by his son-in-law, John Gibson Lockhart, has become a classic.

SCOTT, WINFIELD (1786-1866), an American soldier who distinguished himself in the War of 1812 and the Mexican War was born near Petersburg, Va. He was educated for the law, and was admitted to the bar, but never practiced. Entering the army, he served with distinction in the War of 1812, won the Battle of Chippewa, and was severely wounded in the Battle of Lundy's Lane. In 1832 and in subsequent years, General Scott was employed in operations against the Indians, and in 1841 was appointed commander in chief of the United States



WINFIELD SCOTT

army. His fame rests chiefly upon his brilliant conduct of the Mexican War, where he gained victories at Cerro Gordo, Contreras, Churubusco, Molino del Rey and Chapultepec. Although he was known as "Old Fuss and Feathers," after his successful entry into the City of Mexico and the conclusion of an advantageous peace, he was hailed as a national hero. He was twice an unsuccessful candidate for the Presidency. At the outbreak of the Civil War Scott remained true to the Federal government, but his infirmities rendered him unable to take actual command. He retired from active service in 1861, and in 1864 published his autobiography.

SCOTTI, skot'e, ANTONIO (1866-), an Italian basso in the front rank of operatic stars, was born in Naples. He made his operatic début at Malta in the rôle of Amonasro in *Aida*, at the age of twenty-three. In 1899 he made his initial appearance in the Metropolitan Opera House, New York, and since has been a member of the Metropolitan Opera Company, essaying leading rôles in *Faust*, *Othello*, *La Tosca* and *Il Pagliacci*, but achieving greatest triumph in Mozart's *Don Giovanni*.

SCOURING RUSH. See HORSETAIL RUSH.
SCRANTON, PA., in size the forty-first city in the United States, the third city of

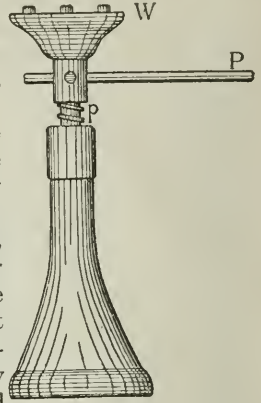
the state and the county seat of Lackawanna County, is on the Lackawanna River, 162 miles north of Philadelphia and 145 miles northwest of New York, on the Delaware, Lackawanna & Western, the Central of New Jersey, the Delaware & Hudson, the Erie, the Central of New Jersey, the New York, Ontario & Western and the Delaware & Hudson railroads. It is the center of a fine and extensive system of electric railways. Scranton has three parks and a public square, in which the courthouse is situated. The chief public buildings are a postoffice, a city hall, a courthouse, an Albright Memorial Library, a Y. M. C. A. building, a Masonic Temple, a Board of Trade, a museum of natural history, a technical high school and two manual training schools. There are several hospitals, a school for the deaf and dumb, hotels of fine appearance and a local life insurance company. The city is the home of the International Correspondence Schools, the largest institutions of its kind in the world.

Scranton is in the center of the northern anthracite coal region and is one of the most important coal-distributing points in the country. There is also an extensive trade in miners' supplies. The industrial plants represent a capital of more than \$30,000,000 and are numerous and extensive, including blast furnaces, rolling mills, foundries, machine shops, glass works, silk mills, locomotive works and manufactories of knit goods, lace, carpets, buttons, pianos and numerous small articles. There are several private and denominational schools.

The first settlement within the present limits of the city was made in 1788 and was named Slocum Hollow. But Scranton was really founded in 1840 by two brothers, Joseph and George Scranton; hence, its name. In 1850 it was incorporated as a borough, and it was chartered as a city in 1866. Population, 1910, 129,867; in 1917, 149,541 (Federal estimate).

SCREW, a simple machine, consisting of an inclined plane wound around a cylinder. The projecting spiral plane is called the *thread*, while the cylinder forms the *body* of the screw. To show that the thread is formed by an inclined plane, cut a paper triangle with one square corner and a length of at least three times its height. Draw a heavy pencil line along the edge of the slanting side of the triangle; then, beginning at the wide end, roll the paper around a pencil,

taking care to keep the edge of the triangle even with the end of the pencil. The dark line along the slanting side forms the thread of the screw. The distance between the threads is called the *pitch*, or *interval*. In the figure, *W* represents the weight; *P*, the point at which the power is applied, and *p*, the pitch.



To determine the weight that can be raised by a screw with the application of a given power, multiply the power by the circumference of the circle which it describes, and multiply this product by the number indicated by the denominator of a fraction showing the pitch. The circumference of the circle is found by multiplying its diameter by 3.1416. To illustrate: To find the weight which can be raised by a power of 25 pounds, acting upon a lever 3 feet long and attached to a screw having a pitch of $\frac{1}{4}$ of an inch, multiply the diameter of the circle, which is 6 feet, by 3.1416, and multiply this product (18.8496) by 12, to reduce the number to inches. The product equals 226.1952 inches. This number, multiplied by 4, the denominator of the fraction indicating the interval, or pitch equals 904.7808. The power, 25 pounds, multiplied by this number, gives 22,619.52 pounds, the weight that can be lifted. Because of the great power gained by the screw, it is used in raising buildings, in presses, and for holding together parts of machinery, pieces of wood and other articles.

SCREW PINE, or **PANDA'NUS**, a genus of plants growing in the tropical parts of the eastern hemisphere, which take their name from the spiral arrangement of their long, pineapple-like leaves. In some species, peculiar roots are sent out from various parts of the stem, which upon entering the ground serve as props for the trunk. One Indian species produces flowers, the fragrant buds of which are used for flavoring purposes and as a basis for perfumes; another furnishes strong fibers, from which the natives make sugar bags; and in another species, the tips of the shoots as well as the seeds are edible.

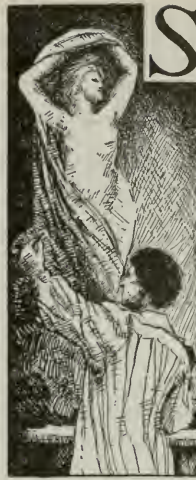
SCRIBE, *skreeb*, AUGUSTIN EUGÈNE (1791-1861), a French dramatist and librettist, born in Paris. His first distinct success was achieved in 1816. From this time on he worked in collaboration with others, and the dramatic pieces ascribed to him, numbering about 400, include all the departments of the lighter drama. Because of their gaiety, plot interest, and the felicitous manner in which their author depicted modern French life, they achieved great popularity over the European continent, and have also been introduced on the American and English stage in the form of translations or adaptations. Two of the best known among them are *Valérie* and *Adrienne Lecouvreur*; he is, however, best known for his libretti, *Fra Diavolo*, *Robert le Diable* and *The Huguenots*.

SCROFULA, a form of tuberculosis in which the neck glands or other lymphatic glands swell, and the tissues become devitalized. Hygienic treatment is the most effective line of cure, with special emphasis on fresh air, nourishing food, tonics and proper clothing. Local treatment of the glands to reduce swelling is also practiced. During the Middle Ages it was believed that scrofula could be cured by the touch of the sovereign, and the disease was known as *king's evil*. It is said that Samuel Johnson was touched by Queen Anne for scrofula when he was a young child.

SCRUPLE, a measure of weight in apothecary's weight, equivalent to 20 grains, $\frac{1}{8}$ part of a drachm, $\frac{1}{4}$ part of an ounce and $\frac{1}{88}$ part of a pound. It is used by pharmacists in compounding medicines.

SCUDDER, *skud'er*, VINA DUTTON (1861-), a notable American woman who achieved fame as an English scholar. She was born in India, and completed her education at Oxford University, England, and in Paris, after which she joined the faculty of Wellesley College, Massachusetts, as professor of English. She wrote *An Introduction to the Study of English Literature*, once a popular text-book.

SCULPIN, *skul'pin*, a group of small fish of about 250 varying-colored species, found in the northern seas and on the Pacific coast of America. The shape resembles that of the bull-head catfish, and the body is covered with warty projections. Common species are known locally as *miller's thumb*, *Irish lord* and *sea raven*.



SCULPTURE, the art of imitating living forms in solid substances. The word means, strictly, a cutting, or carving, in some hard material, as stone, marble, ivory or wood; but it is also used to express the molding of soft substances, as clay or wax, and the casting of metals or plaster. Three forms of sculpture are usually recognized. When the object stands free, it is said to be *in the round*; when it projects slightly from a solid surface it is said to be *in relief*; when it is cut into or sunk down into the surface it is said to be *in intaglio*.

A sculptor wields

The chisel, and the stricken marble grows
To beauty,

wrote the poet Bryant in his *Flood of Years*, and in one of Michelangelo's sonnets the artist speaks of the unhewn stone becoming "a living mould." It is this phase of sculpture that sets it apart from the other arts of design; it is preëminently the art best adapted to the portrayal of the human form, the one that gives "life to the cold marble."

How a Statue Is Made. In most sculpture it is customary for the artist to make for himself an image of life size, fashioned in wet clay. For a head or bust a flat board, set on a high stand, with a piece of wood standing at right angles to it, is used. Lead piping is sometimes employed to raise the height of this piece of wood, and around this structure the clay is roughly built up, a cylindrical mass for the neck and an egg-shaped form for the head. For a full-length figure an "armature" is prepared, consisting of an iron rod through the center, attached to which are other irons, in the case of statues, or lead piping, for statuettes. These are bent to the required positions, the whole, when complete, representing in line the pose and character of the intended figure. Upon and around this framework the figure is first roughly built up with clay, care being taken to add just as much as is requisite and to follow the general form and direction of the muscles. The essential difference between modeling and carving is that in the former

the artist works from within outward, by the addition of material, while in the latter he works from without inward by the taking away of material. The sculptor's work proper generally ends with the completion of the clay model.

The next process is that of casting. Plaster of Paris of the consistency of thick cream is poured over the model, to the depth of from two to three inches, the inner layer being colored. When this is set, the clay is carefully removed, and what is termed a "waste mold" is formed. This is carefully washed and when dry is oiled. Into this mold, plaster of Paris is poured, and when this has set hard, the waste mold is chipped off. The plaster of Paris has taken the place of the clay and formed what is called a "cast." A head is usually cast in halves, and a similar treatment is adopted in the case of complete figures. This is termed "piece molding." Parts which project very much are removed and cast separately, being afterward attached by means of plaster of Paris. The reproduction of this plaster cast in marble or stone is a mechanical operation, usually intrusted to a skilled workman. To aid him he employs a "pointing machine," with which he takes exact measurements. Some sculptors work on the marble after a rough copy of the original is made, and some never touch it, but simply supervise the work. For casting in metal, a plaster mold is first made as already described. Within this is fixed a rudely-formed solid, but removable, mass, called a "core," the space between it and the surface of the mold being filled with the molten metal. Another method for smaller work is used, in which the mold is lined with wax and the core inserted close up to the wax lining. The wax is then melted out and the molten metal poured into the mold to take its place, the core being afterward removed.

History. *Egypt.* It is to Egypt that we must turn for the first signs of a developed form of sculpture. The distinctive characteristics of Egyptian sculpture are colossal size, stability and symmetry, the expression being that of calm repose and solemnity, with a suggestion of the supernatural. A conventional uniformity without life or action reigns everywhere. Most of the sculpture is relief and is defective in perspective and proportion, but the figures have a remarkable dignity and are true to life. The best period of Egyptian sculpture was from 1450

to 1000 B. C. In the British Museum is to be found a splendid collection of Egyptian sculptures, extending from 2000 B. C. to the Mohammedan invasion A. D. 640.

Assyria. The best period of Assyrian sculpture, as a style, is inferior to that of Egypt. Its characteristics are an intense and vigorous spirit of representation, without the least reference to ideal beauty of any kind. As compared with Egyptian work it is more realistic, but less true. It is powerful and energetic, but lacks grandeur; overladen with detail and ornamentation, it does not attain to the sublime in its repose, nor to beauty in its movement. Persian sculpture (560-331 B. C.) differs but little from Assyrian, and is usually included with it.

Greece. Greek sculpture, in its infancy, is strongly stamped with Oriental character, as may be seen by a careful examination of the reliefs from the temple of Assos, now in the Louvre, and the metopes from Selinus, casts of which are in the British Museum. But from the end of the sixth century B. C., the development of Greek art was rapid and continuous. In the sculptures for the Temple of Aegina, executed about 475 B. C., and now preserved at Munich, the figures of the warriors are no longer of the stiff, conventional type, with attitudes correct but lifeless; there is energy of movement in their action, and they have a living truth of gesture, only to be gained by artists who had studied the human form long and attentively. Upheld on the one hand by a noble mythology, that magnified, without distorting, human attributes, and supported on the other by an increasing knowledge of nature, the ultimate perfection of Greek art became only a question of time. It came to perfection in Phidias, whose statues of Athene, in the Parthenon at Athens (438 B. C.), and of Zeus, in the temple at Olympia, mark the period of the highest style of Greek art.

Other sculptors of this period were Myron, famed for his *Discobolus* (*Discus Thrower*), and Polykletus, a close rival of Phidias. The special character of the art that flourished at Athens under the rule of Pericles (fourth century B. C.) consists in a perfect balance and combination of elements sublime and human. Sculpture had reached that point when a faultless imitation of nature was within its reach, but it had not yet abandoned its spiritual connection with a splendid mythology. We have, therefore, in the sculpture

of this period, the highest type of human beauty, joined to a godlike calm and reticence of motion. Examples of the grand style of this epoch are the sculptures of the



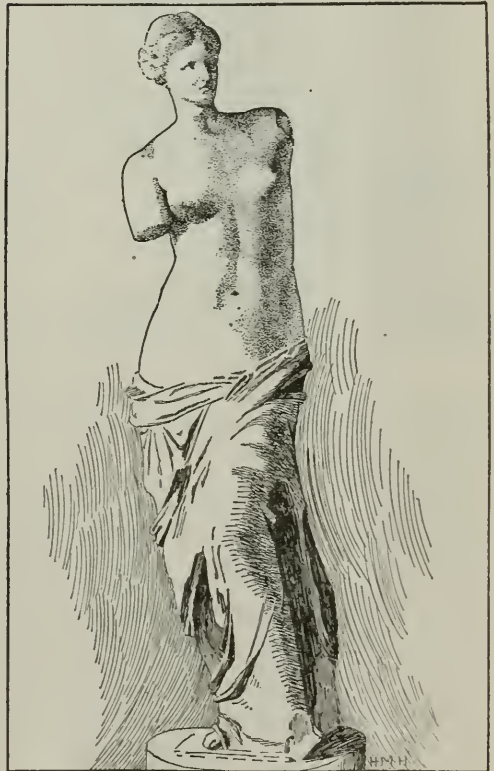
THE "DISCUS THROWER"

Parthenon and the Nike Apteros Temple, on the Acropolis; the colossal bronze head of Artemis, in the British Museum; the Venus of Milo, in the Louvre, and the exquisite relief representing the parting of Orpheus and Eurydice, in the museum at Naples.

Greek art, however, rapidly moved toward a still closer imitation of actual human life. The people, after the Peloponnesian War, spoiled by the luxury and pleasures which the prosperity of the Age of Pericles had opened to them, were not satisfied with the severe forms of the older masters. The sculptors now cultivated the soft, the graceful and the flowing and aimed at an expression of stronger passion, and they began to be fascinated by the force and variety of human feeling, as well as by the beauty of the human form. Jupiter, Juno and Minerva, favorite subjects of the Phidian Era, were exchanged for Venus, Bacchus and Amor. The representatives of this latter style were Scopas, his younger contemporary, Praxiteles, and Lysippus. The most important works of Scopas that survive are the dec-

orations of the mausoleum at Halicarnassus, erected by Artemisia over the remains of her husband Mausolus, Prince of Caria, 352 B. C. These sculptured decorations, now in the British Museum, present in the designs for the frieze, depicting a battle between Greeks and Amazons, an invention of graceful and energetic movement and a record of rapid and violent gesture such as clearly distinguish the work from that which it succeeded.

To Scopas is attributed the original of the *Venus de Milo*, the splendid copy of which now graces the Louvre. When an ancient Greek sculptor really believed in his gods and in the beautiful myths told regarding them, there must have come to him when making statues of them an inspiration which could come from no other task. Such an inspiration must have come to the unknown sculptor who carved the statue found in 1820 on the island of Melos, in the Aegean Sea, and so called the *Venus de Milo*. In the opinion of the critics there is nothing in



VENUS DE MILO

sculpture which surpasses this wonderful statue. The body and the draperies are bat-

tered, and both arms are gone, so that no one can be absolutely certain as to just what the position of the goddess was; but the nobleness of the ideal portrayed, the lines of the figure and the youthful beauty and majesty of the face make this Venus the chief glory of the Louvre, where so many priceless art treasures are gathered. The most plausible idea as to the position of the god-



APOLLO BELVEDERE

dess is the one which suggests that her left foot rested on a helmet and that a shield was supported on her left thigh.

The works of Praxiteles are especially valuable as expressing a tenderness of feeling which this new and closer sympathy with human emotion had developed. He is known to us chiefly through copies of his works, or of the works of his school, the most celebrated of which are preserved in the Vatican; but the sweetness and delicate grace of his style are admirably displayed in the statue of Ceres discovered at Cnidus, now in the British Museum. Lysippus represented the human form and athletic power in the highest perfection. From the death of Alexander the Great, 323 B. c., onward to the conquest of the Romans, 146 B. c., the progress

of Greek sculpture is only a further, and often a weaker, development of the same ideal. The celebrated group of the *Laocoön*, the head of the *Dying Alexander*, the *Dying Gladiator* and *Apollo Belvedere* are some of the works of this epoch that are preserved to us.

The *Apollo Belvedere* is so called from the Belvedere court of the Vatican, in which it now stands. This figure of the youthful god shows him as marvelously beautiful, yet the face expresses a divine wrath, which makes us feel certain that, with his bow in his outstretched hand, he is about to right some wrong or punish some evildoer. The statue loses none of its beauty for us because we know that what was long thought to be a Greek original is only a skilful Roman copy, or because the left hand and right forearm, which had been broken off, were restored by a sculptor in the time of Michelangelo. Notice the wonderfully graceful yet strong pose of the figure, the beautiful fall of the drapery, and the motion expressed in the whole composition. Although nothing definite can be determined as to the time of its production and the artist, the *Laocoön* was probably produced in the second century B. c. Vergil tells the story



LAOCOÖN

which this group illustrates—how Laocoön, priest of Apollo in Troy, warned the Trojans

against receiving into the city the wooden horse left by the Greeks, and how Apollo, to punish him, sent two huge serpents who attacked the priest and his two sons. The artist who made this statue has chosen to portray the moment of fiercest struggle, and thus there is something horrible about it. But the figures are so accurate anatomically, the passion and the pain shown on the faces and in the straining muscles are so real, that the group must rank with the great works of art of antiquity which have come down to us. No less a critic than Goethe held that the older son, the one to the left of the father, is not in pain, but is simply horrified at what he sees his father and his brother suffering, and that he is about to push off the coils of the serpent and stand free.

Between 1863 and 1867 French archaeologists were exploring the site of an ancient town on the island of Samothrace, in the Aegean. They found various objects of interest, but the greatest find of all was the statue which is called the *Nike*, or *Winged Victory*, of Samothrace, which is now in the Louvre. This statue is in a sadly mutilated condition; the head is gone, the arms are gone, the drapery is chipped. And yet it ranks with the *Venus de Milo*, and other of the most beautiful and famous works of art. Study the sketch of the statue given here. Even in this form there is enough to make clear to us the reason for its ranking by the critics. Notice the wonderful poise; the lift of the wings, the sweep of the draperies. It gives one a feeling of lightness, almost of the ability to fly, just to look at it. Nike, or Victoria, as the Romans called her, was the goddess of victory, and this statue was set up by the Greek ruler Demetrius in 306 B. C., after he had defeated the king of Egypt in battle.

After the time of the great sculptor Praxiteles a group of sculptors grew up, who, from the type of subjects in which they delighted, were known as the Pathetic School. The *Laocoön* was a product of this school, as was also another famous statue which is preserved in Florence, and which is probably the work of a pupil of Praxiteles. This is the *Niobe and Her Children*. Niobe was the wife of the king of Thebes and the mother of six beautiful daughters and six handsome sons, of whom she was very proud. In her pride she boasted that she was superior to

Leto, the mother of Apollo and Diana, who had but the two children. Moved to wrath, Apollo and Diana let fly their arrows at the children of Niobe and killed them one after



WINGED VICTORY

another. Finally only the youngest daughter remained. The statue shows Niobe in an agony of grief, trying to shield this last child from death. The story goes that she was unsuccessful, and that Jupiter, in pity for her grief, changed her into a stone which shed tears.

Italy. The history of sculpture in Italy is only a continuance of its story in Greece. It was Greek art, produced by Greek workmen that adorned the palaces of the emperors; and the Roman sculptors, in so far as they had any independent existence, can only claim to have impoverished the ideal they received from Greece. Many of the best-known statues in existence were produced in the Graeco-Roman period; such are the *Borghese Gladiator*, in the Louvre, the *Venus de Medici*, at Florence, and the *Farnese Hercules*, at Naples. From the time of Hadrian (A. D. 138), art rapidly declined, and this debased Roman was the only style employed in Italy

until the revival in the twelfth century. With the general awakening which began in Italy and spread over Europe, came a revival of sculpture, as of all other arts. The stiff, conventional figures of the Middle Ages were invigorated by the spirit of activity which marked the new movement. This revival of sculpture began with Nicola Pisano, who was born at Pisa about 1206 and whose work is preserved in the pulpits which he carved at Pisa and Siena.

He was followed by his son Giovanni Pisano (died 1320), whose great work is the allegorical group in the Campo Santo of Pisa; but both of these sculptors worked on classic lines. Jacopo della Quercia (1374-1438), whose beautiful reliefs, adorning the façade of the church of San Petronio at Bologna, show a feeling for grace not before expressed, was, in a certain sense, the founder of the modern school. Lorenzo Ghiberti (1381-1455) developed a more pictorial style with extraordinary success; but sculpture awaited the advent of Donatello (1386-1468) to find its true direction and to reach its full triumph. Luca della Robbia (1400-1481) and Andrea Verrocchio (1435-1488), the master of Leonardo da Vinci, may also be named. The special tendencies of Italian sculpture may be said to have reached their full expression in the work of Michelangelo (1475-1564). Here all previous efforts to interpret passion and feeling were summed up and concluded. It was toward a complete understanding of the resources of physical expression that all Italian art had been tending, and it is only more fully exhibited in Michelangelo because he was the greatest master that Italy produced. The chief characteristic of his style was the use of colossal, highly developed forms, combined with intense dramatic action. His works are the statues in the chapel of the Medici at Florence, the *Captives*, in the Louvre, the colossal *David*, at Florence, the *Moses*, in Rome, and the *Madonna*, in Bruges.

For a long period after Michelangelo Italian sculptors were content to imitate and sometimes to exaggerate his manner. The only immediate successor of Michelangelo worthy of note is Cellini (1500-1571), of Florence. Lorenzo Bernini (1598-1680), the master of the "barocco" style, exemplifies a straining after grace and elegance by means of affectation. In the eighteenth cen-

tury Italy became the headquarters of the classical revival which spread thence throughout Europe. The leading spirit in this movement was Canova (1757-1822), who, although he failed to restore to his art its earlier masculine strength, at least sought in the study of the antique for greater simplicity and elegance in representation. Canova's most finished productions are notable for an affectionate tenderness of sentiment, rather than imagination, and his figures are never formed after the highest ideal. His most characteristic works are the *Graces*, *Hebe* and the *Cupid and Psyche*; his finest work is the colossal group of *Theseus Slaying a Centaur*, at Vienna. Canova formed Thorwaldsen (1770-1844), the great Danish sculptor, and his name and influence dominated the art of sculpture throughout Europe for many years. Modern Italian sculpture has leaned toward realism, the leading representatives being Gallori, Magni and Ximenes, and of those who avoided this tendency, the best-known are Consani, Albani and Fedi. Further reference to Italian art appears in the article ITALY.

France. The early art of France was influenced by the styles prevailing at that time. Thus the sculptures of French cathedrals show Byzantine, Romanesque and Gothic influences, the finest examples in the last being at Amiens. Awakening in the fifteenth century, it produced, as forerunners of the Renaissance, Bouteillier and Colombe (1431-1514), and in the sixteenth century, Jean Goujon (1530-1572), whose best work is the *Fountain of the Innocents* in Paris, and whose *Diana* shows all the faults and beauties of the style. Cousin (1501-1589), Pilon (1515-1590), Pierre Puget (1622-1694), Coysevox (1640-1720) and Girardon (1630-1715) continued the style which, while aiming at elegance and grace, lost simplicity and roundness. The Danish school which produced Thorwaldsen, owes its rise to French influence. Later yet came Houdon (1741-1828), Bosio (1769-1845), Rude (1785-1855), Barye (1795-1875), a sculptor of animals, and Carpeaux (1827-1875), whose chief work, *La Danse*, is in front of the new opera house in Paris. Among recent artists are Saint Marceaux, Frémiet, Falguière, Mercié, Dalou, Rodin, Dubois, Bartholdi, Barrais, Bartholomé and Riviere. Among these, Rodin (1840-1917) holds the foremost place.

Germany. There was no early school of German sculpture, apart from the general Gothic style of all northern European countries, but with the Renaissance of the fifteenth century arose Adam Krafft (1480-1507) and Peter Vischer, two contemporary sculptors of Nuremberg, and Albert Dürer (1471-1528), painter and sculptor. Then came a break until the rise of the modern school, which owes its existence to the influence of Thorwaldsen. The chief names are Dannecker (1758-1841), with his *Ariadne*, and Schadow (1764-1850), with *Girl Tying Her Sandal*. Rauch (1777-1857) was the real founder of the modern German school. His monument to Frederick the Great, in Berlin, with its many accessory figures, is his finest work, and from his school came Rietschel (1804-1861), Schwanthaler (1802-1848), August Kiss (1802-1865), Bandel (1800-1876) and Drake (1805-1882). Among sculptors of recent fame are Begas, Eberlein, Zumbusch, Kundmann, Weyr, Tilgner, Strasser, Wolff, Hildebrand and Schilling.

England. Of examples of sculpture executed before the eighteenth century England possesses very few. Several tombs exist, and some of the cathedrals, notably Wells, Exeter and Lincoln, possess figures executed presumably by Englishmen at an earlier date. It is not, however, until the reign of Charles I that names of artists appear, notably among them being Nicholas Stone (1586-1647) and Grinling Gibbons (1648-1721), who was the first real artist of the English school. Banks (1735-1805) is the father of ideal English sculpture, but he died unappreciated, leaving John Flaxman (1755-1826) to achieve the task of bringing the classical spirit into English art and of founding the school of the nineteenth century. His love for severe simplicity and true form was imbibed in Rome, and it is best seen in his *Shield of Achilles*, in his *Michael Overcoming Satan* and in his *Cephalus and Aurora*. His most famous pupil was Baily (1788-1867), whose *Eve at the Fountain* is much admired. John Gibson (1791-1866), a pupil of Canova, more properly belongs to the Italian than to the English school, his whole artistic life having been passed in Rome. His finest works are *Psyche Borne by Zephyrs*, *Narcissus*, *Hylas Surprised*, now in the National Gallery, and a large relief of *Christ Blessing Children*. His introduction of color in statuary raised

much discussion. Foley (1818-1874), whose chief work is the equestrian statue of General Outram, now at Calcutta, and Patrick Macdowall (1799-1870), with *Love Triumphant*, are the last of the classic school.

The tendency of sculpture in England at the present day is toward a more original and naturalistic treatment. Alfred Stevens (1817-1875) is the author of the finest decorative work in England, the monument of the Duke of Wellington in Saint Paul's. Of late sculptors who have contributed to England's reputation are Boehm, Woolner, Watts, Leighton, Armstead, Simonds, Brock, Thorneycroft, Ford, Gilbert, Bates, Franklin, Stark and Pomeroy.

Other Countries. The Renaissance began earlier in the *Netherlands* than in the other northern countries and had its center at Dijon, in Burgundy, where a number of important masters were active, among whom was Claux Sluter. In the seventeenth century the school of Antwerp gained prominence and produced such sculptors as François Duquesnoy (1594-1644), and his pupil Artus Quellinus (1609-1688), who showed Italian influence. The eighteenth century noted a decline of sculpture in the Netherlands. *Scandinavia* followed the other nations in the general plan of development. The influence of the Netherlands and France was felt in the eighteenth century. The most important names are Sergel (1740-1814), Bystrom (1783-1848) and Bissen (1798-1868). In the nineteenth century, Thorwaldsen (1770-1884), the great Danish sculptor, stands as the chief exponent of the antique tendency in sculpture.

United States. The first American sculptors of importance are Greenough (1805-1852), a portrait statue artist of marked achievement; Powers, whose *Greek Slave*, *Il Penseroso* and *Proserpine* are well known; Crawford, who produced *American Revolution* and *Indian Chief*. Of later artists in the same group are Palmer Story, Randolph Rogers, John Rogers, Rinehart and Hosmer. These, with the intensely patriotic Henry Kirke Browne and J. Q. A. Ward, form a school of distinctive American art, noticeable both in theme and execution. Others of less fame are Clevenger, Bartholomew, Meade and Launt Thompson. Since about 1875, American sculpture has been greatly influenced by the French, though some of the more important artists have had Ger-

man and Italian training. Of the German-American group, Keyser, of Baltimore, is the most important. Howard Roberts and Levi Warner were among the first to display the French influence. Of recent fame are Augustus Saint Gaudens and Daniel C. French, both masters of the art, whose works have placed them in the front rank of modern sculptors. Notable among the works of French are the bronze statue of Washington, executed as a gift of American citizens to France, and the bronze doors of the Boston Public Library. Saint Gaudens' greatest works are the *Shaw Memorial*, on the Boston Common, and the bronze equestrian statue of Sherman, at the principal entrance of Central Park, New York. The latter is counted among the half-dozen greatest equestrian statues of the world.

Frederick MacMonnies, a pupil of Saint Gaudens, achieved honor, both at home and abroad. Herbert Adams, Partridge, Paul Bartlett, Bitter, Niehaus, Rhind, Proctor, Kemys, Barnard, Borghum, Mulligan and Lorado Taft are among those who have reflected credit upon American sculpture within recent years. On the whole, it may be said of American sculpture that it has started along a path which leads to works of permanent value, namely, independent and consistent labor. It does not disregard the classic forms, but it adds to them an individuality and flexibility which well represents the free and vigorous characters of American life. Such buildings as the Library of Congress at Washington and such decorative achievements as the sculpture of recent exhibitions testify both to the demand for good art and the ability of American sculptors to meet that demand.

The Study of Statuary in School. It is much to the advantage of the school to have one or more groups of statuary so placed that they may be seen daily by all the pupils. Excellent casts of the best works of the great masters, both ancient and modern, can be procured at such small cost as to make it possible to procure these works of art wherever a desire for them is awakened.

In giving lessons on statuary the teacher will be aided by the following suggestions:

1. If possible, let the lessons be upon the statue instead of upon a photograph of it. However, it is better to give lessons upon the photographs than not to give them at all.
2. Select the subject with care. Some people object to the nude in art, and if the

lessons are to be successful with all pupils these objections must be heeded. Remember that the actions of children appeal to the pupils, and so far as possible choose subjects containing children.

3. If photos must be used, try to have enough so that you can place a copy in the hands of each member of the class. It will be well to distribute these pictures a day or two before giving the first lesson.

4. A statue requires more study than a picture like that chosen for a picture study lesson. Therefore the statue needs more time upon it.

5. At first select only the most striking features. As the class shows the ability to grasp details they can be introduced.

6. Make the lesson short and usually let several days intervene between succeeding lessons. One or at the most two lessons a week are enough for subjects of this sort.

7. When the study is completed, require the pupils in the older classes to write a description of the statue. Pupils in the primary grades should be called upon to give oral descriptions.

The Sun Vow. *The Sun Vow*, the work of Hermon A. McNeil, is the embodiment of a legend long standing among the American Indians. According to this legend, before a youth could be recognized as a man and be allowed to take his place among the warriors of his tribe, he must shoot an arrow at the sun as a test of his strength and skill. If truly aimed and vigorously sped, the arrow went far out of sight in the sun's rays and the youth was deemed worthy. Otherwise he remained longer with the squaws. The group further represents age about to pass from earth and youth about to enter upon the activities of life. This idea is vividly portrayed in the contrast of the figures of the old chief and the boy.

All children are hero worshipers, and boys especially like the heroic. Therefore the group selected for our study will be of special interest to them.

1. Make a careful study of the group and determine what you wish to bring out in the lessons before presenting the subject in class.

2. Introduce the lesson by telling the legend upon which the work is based. Ask the pupils about such customs of the Indians as are especially related to this legend, such as their weapons of warfare and manner of dress. Bring out the fact that in some tribes children and youths were often unclad.

3. Notice the perfect muscular development in the youth.

Call attention to the position of the arm and bow. Are these natural?

4. It may lend interest to the study to have some boys make a bow and arrow and let members of the class take turns in shooting



THE SUN VOW

DEFINITION

The art of imitating living forms in solid substances.

PROCESSES

1. Modeling. The use of clay in the fashioning of the image.
2. Casting.
 - a. Plaster of Paris poured over the model.
 - b. The plaster of Paris removed, and plaster of Paris poured into the new model.
 - c. Reproduction of the plaster cast in marble or stone.

SCULPTURE

FORMS

1. When the object stands free it is said to be in the round.
2. Projecting slightly from a solid surface it is in relief
3. When cut into or sunk down into the surface it is in intaglio.

Egypt

1. First signs of a developed form of sculpture.
 2. Characteristics: Colossal size, stability, symmetry, calm repose, solemnity.
 3. Best period from 1450-1000 B. C.
- Best period inferior to that of Egypt.
- Characteristics: Intense and vigorous spirit. No reference to any ideal beauty, over-laden with detail and ornamentation.

Assyria

3. Persian sculpture (560-331 B. C.) usually included with Assyrian.
1. Development rapid and continuous from end of sixth century B. C.
2. Came to perfection in Phidias, in his Athene and Zeus.
3. Characteristics of the Periclean age: A perfect balance and combination of elements sublime and human.

Greece

- Sculptures of Parthenon; the Venus of Milo.
4. Period of Scopas, Praxiteles, Lysippus. Soft graceful forms: Venus, Bacchus, Amor.
 5. From 323-146 B. C. Dying Gladiator, Apollo Belvedere.
 1. A continuance of Grecian sculpture. Decline.
 2. The revival came in twelfth century with Nicola Pisano, and came to its triumph in Donatello.
 3. Reached its full expression in Michelangelo, who summed up and concluded previous efforts to interpret passion and feeling.
 4. Modern sculpture tends to realism.

Italy

France

1. Early art expresses Byzantine, Romanesque and Gothic influences.
2. From fifteenth to eighteenth century: Bouteiller, Colombe, Goujon, Cousin, Pilon, Puget.
3. Eighteenth and nineteenth centuries produced Houdon, Bosio, Rude, Barye, Carpeaux.
4. Recent artists: Saint Marceaux, Frémiet, Dalon, Dubois, Bartholdi, Riviere.

Germany

1. The Renaissance produced Kraft, Vischer, Düser.
2. Influence of Thorwaldsen originated the modern school, but the real founder was Rauch. From his school came Rietschel, Schwanthaler, Kiss, Baudel, Drake.
3. Of recent fame: Begas, Eberlein, Zumbusch, Hildebrand, Schilling.

England

1. Few examples before eighteenth century.
2. Gibbons, the first real artist of the English school.
3. Banks, the father of ideal English sculpture, but the school of the nineteenth century was founded by Flaxman.
4. Foley and Macdowall the last names of the classic school.
5. Present tendency toward originality and naturalism.

United States

1. First sculptors of importance: Greenough, Crawford, Palmer, Story, Rogers, Rinehart, Hosmer, Browne, Ward.
2. Since 1875 American sculpture influenced by the French. Howard Roberts, Levi Warner.
3. Of most recent fame: Augustus Saint Gaudens, Daniel C. French. Also, MacMonnies, Adams, Partridge, Bitter, Niehaus, Rhind, Proctor, Kemys, Barnard.

Questions on Sculpture

In what respect does sculpture differ from the other arts of design?

Describe the process of making a statue.

What are the three forms of sculpture?

What are the chief characteristics of Egyptian sculpture? Of Assyrian?

What are the important elements of the art that flourished in Athens during the rule of Pericles?

How did Grecian art change after the Peloponnesian War?

Why is the *Venus de Milo* a masterpiece? Where and when was it discovered?

What great works of art are in the Louvre?

Upon what story is the *Laocöon* based?

What is the story of Niobe, and how has it been portrayed in art?

What are the chief qualities in the work of Michelangelo?

Who was the leading spirit in the classic revival in Italy?

What great sculptors have France and Germany produced?

What did John Flaxman do for English sculpture?

For what is the Danish sculptor Thorwaldsen noted?

What great works has Augustus Saint Gaudens produced?

What suggestions can you give in regard to the study of statuary in schools?

the arrow into the air. Have the other members of the class compare the position of the one shooting with that of the one in the statue.

5. Contrast the angular figure of the old chief with the beautiful muscular figure of the youth.

6. Again contrast the expression of calm resignation of the old man with that of eager expectancy on the countenance of the youth.

Does the old man want the boy to succeed? What does failure mean to the boy?

Bringing out these contrasts will reveal the remarkable delicacy and skill of the sculptor as well as the thorough knowledge of his subject. It is given to but few to work clay, marble or bronze so delicately as to portray accurately the thoughts and feelings indicated by the countenances in this group.

Call the attention of the older members of the class to the composition. Notice how perfectly the group is balanced. Notice how natural is the position of each figure, and especially the lifelike appearance of the group as a whole. Lead the pupils to see that these characteristics, together with the contrasts to which attention is called above, make this group not only an object of beauty, but a work of the highest art as well.

Related Articles. Consult the following titles for additional information:

GENERAL

Alto-Rilievo	Cast	Mezzo-Rilievo
Bas-Relief	Colossus	Parthenon
Bust	Elgin Marbles	Sphinx
Carving	Liberty, Statue of	

SCULPTORS

Barnard, George	Grey	Phidias
Bartlett, Paul	Way-	Powers, Hiram
land		Praxiteles
Borglum, Gutzon		Robbia, Della
Canova, Antonio		Rodin, Auguste
Cellini, Benvenuto		Rogers, John
Crawford, Thomas		Rogers, Randolph
Donatello		Rude, François
French, Daniel	Chester	Saint Gaudens, Augustus
Ghiberti, Lorenzo		tus
Hosmer, Harriet		Schilling, Johann
Houdon, Jean Antoine		Stoss, Veit
Leighton, Frederick		Taft, Lorado
Lysippus		Thorwaldsen, Bertel
MacMonnies, Frederick		Ward, John Q. A.
Michelangelo, Buonar-	rotti	Watts, George Frederick
Partridge, William		Ordney

SCURVY, a disease formerly very prevalent among sailors, because of their being compelled on long voyages to live exclusively upon salt meat and hard bread, with impure water. In recent years the disease on ships is little known, because of better sanitary provisions and more abundant supplies of food. It is due to poor nourishment and is rarely seen, except among the poor and careless. Severe cases of scurvy are accompanied by swellings in different parts of the body and by swollen gums, which become ulcerated and bleed, making it almost impossible to eat. In fact, unless suitably treated, it progresses to exhaustion and death.

Treatment consists in a change of diet. Those who eat plenty of vegetables are never troubled with scurvy. Lemon juice is a valuable preventive and is required by law to be a part of the diet of all sailors in the British navy.

SCUTARI, *sko' tah re*, ALBANIA, a fortified town on the southeastern shore of the Lake of Scutari, situated near the junction of the Drin and Boyana rivers. Before the Balkan Wars the town was the capital of a Turkish vilayet (province), but in 1913 it was captured by the Montenegrins, and by the Treaty of Bucharest was made a part of Albania. In the World War Scutari was

captured by the forces of the central powers, and occupied by them until nearly the close of the war. The town lies on a plain situated about twelve miles from the Adriatic Sea and surrounded on three sides by mountains. In normal years there is a thriving export trade in skins, woolen goods, grain and fish, and cotton manufacture is of considerable importance. Population, estimated, 32,000.

SCYLLA, *si'ah*, and **CHARYBDIS**, *ka ri'b'dis*, the former, according to a Greek myth, once a beautiful girl transformed into a six-headed monster because of the jealousy of Circe. She lived under a rock opposite Charybdis and was wont to thrust forth her long necks and in each of her mouths seize one of the crew of every passing vessel. The whirlpool Charybdis, almost opposite the entrance to the harbor of Messina, in Sicily, engulfed every passing vessel when the tide was rushing in. The term, "between Scylla and Charybdis," indicating the difficulty of steering between rock and whirlpool, in modern phraseology has come to mean one of two dangers or evils which must be met.

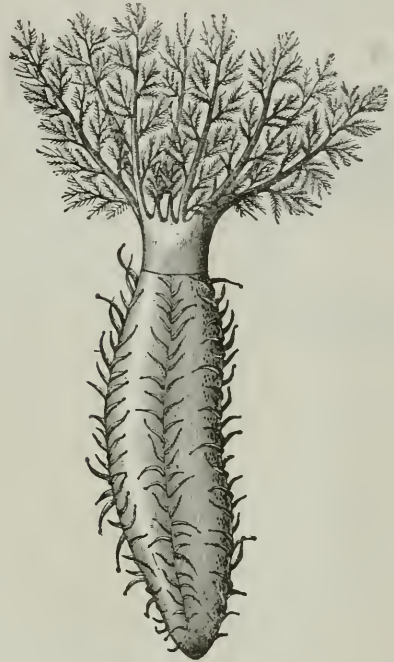
SEA. See OCEAN.

SEA ANEMONE, *a nem'o ne*, the popular name of a number of sea animals somewhat resembling flowers, from which they derive their name. They are the second lowest among the divisions in the animal kingdom, and with the jellyfish and corals are classed in the branch *Coelenterata* (which see). Sea anemones differ somewhat in size and form, but in general all appear as fleshy cylinders, attached by their bases to rocks or stones, and presenting at their free extremities mouths surrounded by circlets of arms or tentacles. With these tentacles, in some cases exceeding two hundred in number, they seize their food, consisting of a small variety of sea animals, which they paralyze by means of stinging cells, common to this branch of the animal kingdom. The appearance of anemones with their tentacles extended is very beautiful, as they are of all varieties in color and have the appearance of fully-expanded flowers, which, however, close suddenly when touched in any way. Although sea anemones are attached to rocks, they are able to detach themselves and move about at will.

SEA COW. See MANATEE.

SEA CU'CUMBERS, or **HOLOTHURIA**, *hahl o thu'ri a*, the name of a group of

sea animals, belonging to the same branch as starfishes, sea urchins and sea lilies. They are covered with a tough, leathery skin which is perforated with holes,



SEA CUCUMBER

through which the foot-tentacles protrude (see ECHINODERMS). The animals are capable of contracting and extending themselves to several times their ordinary length, and they will reproduce to an extraordinary degree parts of the body which are cut away or destroyed. They abound along the eastern coast of Asia, and some species are edible. See TREPANG.

SEA HORSE. See HIPPOCAMPUS.

SEA ISLANDS, the small islands which gave their name to a fine variety of cotton called sea-island cotton (referred to in the article COTTON). They are located off the coast of South Carolina, between Charleston and Savannah, are near the shore and separated from it by narrow lagoons. Besides cotton, the islands are well adapted to the cultivation of rice.

SEA KALE, also called **CHAMBE**, is a perennial plant of the Cruciferae family (which see), important as a food on the Atlantic coast of European countries. Its sprouts are blanched and are eaten like asparagus. It is propagated by cuttings or offsets.



SEAL, a warm-blooded, air-breathing, animal that lives both in the water and on the land. A few seals are found in the Caspian Sea and Lake Baikal, but, with these exceptions, all seals are inhabitants of the sea. They are divided into two classes, called *true seals*, which have no external ears, and *eared seals*.

General Description.

The seal has a body which is large at the front and tapers toward the tail, like that of the whales. It

has four legs, which are almost covered by the skin of the body, while in place of the feet are fins or flippers. The hind legs are used in swimming, and the fore legs support the animal in an erect position when he is on the land. The mouth is large and is surrounded by numerous feelers, resembling those of the cat. The eyes are large, with an almost human expression, and the ears are small or entirely lacking. The body is covered by thick, woolly fur and long, shining hair, and all is so oily and smooth that it enables the seal to move easily through the water. Seals are air-breathing animals, but they can remain under water for a considerable time. They are expert divers and swimmers, but are exceedingly awkward on land.

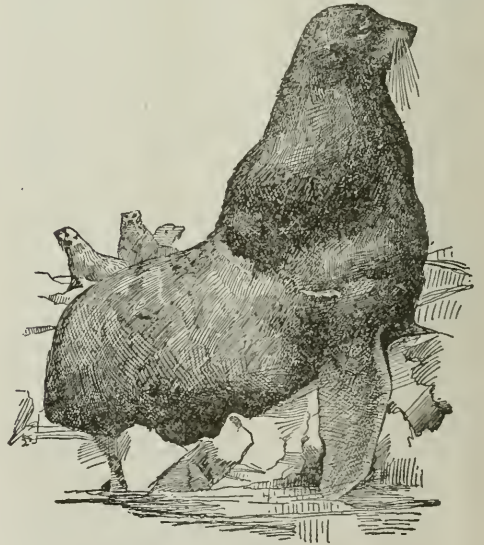
Where Seals Live. Seals inhabit the cool waters of the temperate and polar regions and usually return to the same spot year after year to breed. They live in herds, and before they were hunted many of these herds were of enormous size. They frequent rocks in shallow places and icebergs, where they come at breeding time and remain to rear their young. Most species are easily tamed, and they often form great attachment for their keepers and are easily taught ingenious and amusing tricks.

Sealing. The hair seal, which is the common seal of the Atlantic coast, has long, silky hair, and is valuable for its skin and fat, called *blubber*. It is captured in large numbers off Newfoundland, Labrador, Jan Meyen Island and in the White Sea. The inhabitants of Greenland hunt these seals for food and clothing, but they take only a

sufficient number to supply their needs. In many places these seals have been nearly exterminated by hunters, because the skins make good leather, and a valuable oil is extracted from the blubber. The hair-seal industry is really more important than the fur-seal industry, although it has not received as much attention. Finally the danger of exterminating these animals became so imminent that by international agreement the sealing season was restricted, and now about 250,000 seals are taken annually. Under these restrictions the herds seem to maintain their size.

Fur Seal. The fur seal or *sea bear* is highly valued for its fur, which consists of a thick, woolly hair next the skin, very fine and compact, usually of a dark brown color. Over this grows long, coarse hair, which is of some shade of gray. The fur seals are found in the water of the cool temperate or polar regions north and south of the equator, though in the Antarctic regions they are almost extinct.

One herd of seals, which constitutes a distinct species, and that the most important of all the seals, makes its home on the Pribilof Islands, a barren little group in Bering Sea. The study of these animals and their habits, as exhibited on Saint Paul and Saint George,



FUR SEAL

the two largest islands, has been as fascinating to men of science as their capture has been profitable to traders. Every spring

the seals return by thousands to this chosen home, and many of them have specially favored places which they seize each year, and for which they will fight to the death. Each old male, or bull, gathers about him a large number of females, sometimes as many as one hundred, whom he defends against the other bulls, and from whom he exacts the strictest obedience. Through all the long period from spring until August the bulls fast, but the mothers, soon after the young seals, or pups, are born, swim away to the south to find food. The little seals are thus left sometimes for a week, but when the mothers return each is able to distinguish her own pup from all the others of the great group. The pup, too, can tell its own mother's voice, though hundreds or thousands of others may be calling at the same time.

When winter comes, and the storms begin, the seals depart for the south, often going down as far as Lower California; but nowhere do they land and establish a home until with the spring they return to the Pribilof Islands.

The full-grown male fur seal is almost as large as a bear, being often twice as long and weighing four or five times as much as the female. It is the young males which are killed for their fur, for they are the least necessary part of the colony, as the old bulls will not allow them to set up families until they are seven or eight years old, at least. The killing of seals on the Pribilof Islands is carefully regulated by the United States government and only a small number may be killed each year; but in spite of care the number has steadily lessened, and in 1910 killing was forbidden for a period of five years. There are other seal breeding grounds, or rookeries, on other groups of islands, but none are as large or as important as the one on the Pribilof Islands.

The animals are killed by clubbing them when they are on land, where they are comparatively helpless. The skins are salted and packed in the holds of vessels until the close of the season. The beautiful fur is seldom seen in its natural state. As usually prepared, the long gray hair is removed by scraping the pelt on the under side until the roots of this hair, which penetrate the skin farther than those of the fine hair, are cut; then by whipping the pelt the long hair is

easily removed. The skins are then dyed dark brown or almost black, and in this form constitute the ordinary sealskin of commerce. See ELEPHANT SEAL; SEA LION.

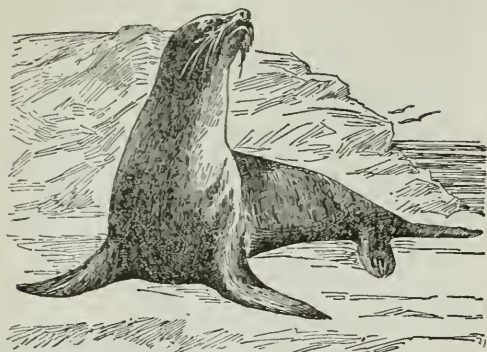
SEAL, a sign or mark, but usually an engraved stamp bearing a device or inscription, impressed on paper, metal or wax, and attached to important documents. The seal of country or state must be attached to legislative acts before they can go into effect GREAT SEAL OF THE UNITED STATES. This was first adopted by Congress in 1782, and the design was ordered changed by the same body in 1885. On the obverse side is an eagle typifying the government. In one claw the eagle clutches an olive branch and in the other arrows, typifying power in both peace and war. A constellation above denotes the thirteen original states. The motto, "E pluribus unum," signifies unity, and the escutcheon borne unsupported on the breast of the eagle signifies virtue and honor. The reverse side of the seal shows a pyramid, signifying strength. Above is an eye and the motto, "Annuit coeptis," signifying providential direction; below are the date (1776) and the motto, "Vovus ordo seclorum," signifying the beginning of the America Era.

SEA LILIES. See CRINOIDEA.

SEALING WAX, a resinous preparation used for securing folded papers and envelopes and for receiving impressions of seals set to instruments. Ordinary red sealing wax is made from shellac melted with rosin, to which are added Venice turpentine and vermilion. Inferior qualities consist of a proportion of common resin and red lead and black; other colors are produced by substituting appropriate pigments. The invention of sealing wax is credited to the Chinese in the seventh century.

SEA LION, the name given to a large group of eared seals, which, though closely related to the fur seals, are not of value as fur producers. All have long, cylindrical bodies, small, round heads, pointed noses, thick skin, with an under layer of fat for protection against cold, and coarse hair. The individuals of some species have manes. The largest animals, belonging to the Steller group, attain a weight of a thousand pounds and more, and a length of fourteen feet. Their particular habitat is the Northern Pacific. The natives of the Aleutian Islands catch thousands of these seals. They use the flesh for food, the hide for shoes and

boats and the sinews for thread. Another group, called California sea lions, is made up of smaller animals. Sea lions are seen



SEA LION

in large numbers on the Pacific coast cliffs. They are peaceable creatures, but if attacked defend themselves fiercely. They are protected by law, but a few are allowed to be taken for menageries and zoological gardens.

SEARCH, RIGHT OF, in international law, the right claimed by a nation at war to authorize the commanders of its lawfully commissioned cruisers to enter and search private merchant vessels of neutral nations on the high seas for the purpose of examining their papers and cargo and to search for enemy property or contraband of war. It is also the right claimed by a nation to search vessels of other nations in order to seize citizens of the former in the service of the latter. England's insistence on the right of search was one of the causes leading to the War of 1812.

SEARCH WARRANT. See **WARRANT.**

SEA ROBIN. See **GURNARD.**

SEA SERPENT, a marine monster, often reported as having been seen, although there is no proof that such a creature exists. Various accounts assert that it is sixty feet or more in length and that it swims with its head and part of its body above water. However, this is generally regarded as a myth, and the explanation is that people have been deluded by the sight of shoals of fish, or logs of wood or seaweed.

SEA SICKNESS, a nervous attack, produced by the motion of the sea. The symptoms are headache, nausea, vomiting, general weakness and sometimes extreme depression. Usually an attack passes off quickly, as the person becomes accustomed to the sea, and will not recur, at least during the

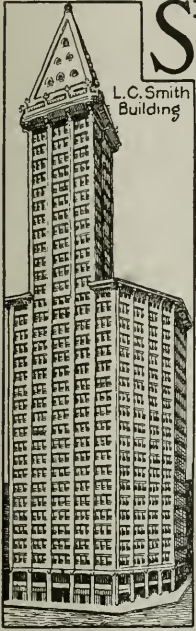
continuance of the voyage. Some persons are always more or less ill when on the water and become violently so when the sea is rough. Children and aged persons are more frequently exempt than others. Many remedies have been suggested for seasickness, but none seems to be effective in all cases. One should not overload the stomach and should take active exercise in the open air. If, however, the attack is severe, the patient should go to bed for a day or two. However, long confinement in a stateroom is bad, and it very often happens that the attacks will disappear entirely if the patient seeks the open air.

SEASONS, *se'z'nz*, the four periods into which the year is divided by the ever-changing position of the earth in relation to the sun. As the earth revolves about the sun in a nearly circular orbit, its axis at all times points toward the Pole Star and is inclined to the plane of its orbit $23\frac{1}{2}^{\circ}$. Therefore different parts of its surface are at different times of the year exposed to the vertical rays of the sun. Astronomically speaking, in the northern hemisphere spring extends from March 21, the time of the vernal equinox, to the summer solstice, June 21; summer from June 21 to September 21, the time of the autumnal equinox; autumn to December 21, and winter from that date to the beginning of spring. In the southern hemisphere the seasons are reversed, and spring begins September 21. In the torrid zone the changes in the seasons are not marked by differences in temperature, but by wet and dry periods. See **EQUINOX**; **SOLSTICE.**

SEA SQUIRTS, *skwurts*, or **ASCIDIANS,** *as sid'i anz*, a name commonly given to certain low-grade mollusks, so called because of their habit of squirting jets of water when touched or irritated. They somewhat resemble double-necked bottles, and are of leathery or gristly nature. They are found at low water on a

SEA SQUIRTS
Colony on branch of seaweed.

sea beach or are dredged from deep water attached to stones, shells, seaweed and fixed objects. There are numerous species, all of which pass through peculiar phases of development. The young sea squirt resembles the tadpole of the frog, and is free-swimming.



S EATTLE, WASH., the "Queen City," the county seat of King County, and the largest city in the state, is situated on the East Coast of Puget Sound, 1,822 miles west of Saint Paul, 864 miles by water north of San Francisco, thirty-five miles north of Tacoma and 185 miles by rail north of Portland, Ore. The city occupies a beautiful site, between Puget Sound on the west and Lake Washington on the east. It is built upon a series of hills, which in some places rise to the height of 300 feet and are separated by broad valleys or terraces. The main streets run north and south, and the

cross streets, east and west. An excellent street car system connects all parts of the city and the important suburbs. The streets have been graded at great expense and are well paved. The city has forty-four parks and twenty-four improved playgrounds, the combined area of parks and playgrounds covering 1,818 acres. The most interesting parks are Jefferson Park, which maintains municipal golf links; Seward Park, on Lake Washington; Woodland Park with its athletic field and zoological garden; Ravenna Park, noted for its large trees and mineral springs, and Volunteer Park, from which a fine view of the city and surrounding country may be obtained.

Buildings. Among the important public buildings are a new Roman Catholic Cathedral, costing \$500,000; the First Baptist and First Presbyterian churches; the First Church of Christ Scientist; the King Street passenger station; the O.-W. and Milwaukee station; the Washington Hotel, the Providence Hospital and a Federal building. Most of the buildings in the business center are constructed of steel and brick or stone. The

most noted of these is the L. C. Smith Building (forty-two stories), the highest building west of New York. Other structures worthy of mention are the Metropolitan Building; the Alaska, Hoge and Cobb buildings and the buildings of the Arctic, Sunset and Rainier clubs. The leading theaters include the Metropolitan, Pantages, Orpheum and Wilkes.

Education. The University of Washington is the most important educational institution of the city and of the state. Other prominent schools include the Academy of the Holy Name, the College of Our Lady of Lourdes, the Washington Preparatory School for Girls, Adelphia College and Seattle College. The public schools are of a high order and include six high schools and nearly seventy grammar schools.

Industries. Abundant water power and electric power obtained from plants near the city have been leading factors in making Seattle one of the most important manufacturing centers on the Pacific coast. The manufacture of lumber is the leading industry, and the lumber mills at Port Blakeley are the largest in the world. Fish packing and canning furnishes employment to a large number of people. More than 100,000 tons of fish and fish products are handled in the city every year. Other important industries are meat packing, the manufacture of flour and machinery, and printing and publishing. The United States navy yard at Bremerton, across the Sound, is an important shipbuilding station.

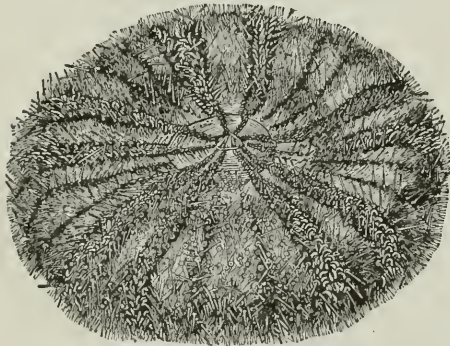
Transportation and Commerce. Seattle has one of the best harbors in the world, and the completion of a canal joining Lake Washington to the Sound has greatly increased the water front. The city is the terminus of the Northern Pacific, the Great Northern, the Chicago, Milwaukee & Saint Paul and the Union Pacific railroads. The Chicago, Burlington & Quincy enters the city over tracks of another line, and the Canadian Pacific and the Grand Trunk Pacific have steamship connection. The Oregon & Washington and other lines connect the city with other Pacific towns.

On the water front are found the extensive docks and railway stations devoted to the handling of freight and to the wholesale trade. This is the most convenient port for all traffic going to Alaska and for much of that between the United States and China

Japan, Hawaii and the Philippine Islands, and since the occupation of the Philippines by the United States the oriental trade of Seattle has rapidly increased. There is also an extensive local trade by water between the city and numerous other towns on Puget Sound. The largest ocean steamships can reach Seattle docks in all seasons of the year.

History. The city occupies the site of a former Indian town. The first settlement by white men was in 1852, and the next year the town was laid out and named after an Indian chief. It had a population of 300 in 1855, but prior to the arrival of the first transcontinental railway in 1884 its growth was slow. In 1889 a fire destroyed the main portion of the city, causing a loss of over \$10,000,000. The discovery of gold in Alaska and the acquisition of the Philippines brought Seattle into prominence as a commercial center, and it has continued to increase in population and wealth ever since. The water work, light and power plants and a part of the street railway lines are owned by the municipality. The Alaska-Yukon-Pacific Exposition was held here in 1909. In 1919 the Bolshevik element in the Northwest, by a general strike, endeavored to establish soviet rule in Seattle, but the effort was defeated by the courage of Mayor Ole Hanson. Population, 1910, 237,194; in 1917, 366,445 (Federal estimate).

SEA UR'CHIN, or **ECHINUS**, *e ki'nus*, a genus of sea animals, belonging to the same group as the starfish, sea lily and sea cucumber (see **ECHINODERMS**). The body of the sea urchin is more or less globular and cov-



UNDER SURFACE OF SEA URCHIN

ered with a shell which is often studded with movable spines. Sea urchins, of which there are many species, are found in shallow water in almost all parts of the world, those of the tropical regions being largest.

SEA'WEED, the common name for any plant which grows in water. See **ALGAE**; **KELP**.

SEBASTIAN, *se bas'chan*, **SAINT** (?-288), a Roman soldier and Christian martyr who was put to death by Emperor Diocletian. His position as captain of the Praetorian Guard gave him the coveted opportunity of spreading Christianity and protecting its adherents. Diocletian, on hearing of this, ordered Sebastian to be tied to a stake and shot with arrows. Irene, a Christian, is said to have taken him to her home and cared for him until his wounds were healed. When Sebastian, after his recovery, accused Diocletian of cruelty, the young soldier was condemned to be beaten to death. Paul Veronese, Holbein, Luini and others have immortalized Sebastian in their art.

SEBAS'TOPOL, the chief naval harbor of Southern Russia, situated on the southwestern extremity of the Crimean peninsula, at the head of a four-mile inlet which constitutes one of the best roadsteads of the old Russian Empire. The city occupies a strip of land between two bays at the head of the inlet, on elevated ground. It is strongly fortified, and there are forts north and south of the city and at the entrance to the roadstead. There are extensive docks, and shipbuilding is the principal industry. Wine making is a source of revenue, but there is very little commerce. Near by is the Greek colony of Chersonesus. Sebastopol was founded by Catharine II in 1784, and in 1804 it was made a naval base. The place was the scene of a terrible siege in the Crimean war and of a Turkish bombardment in 1914.

SECESSION, *se sesh'un*, in United States history, a term applied to the withdrawal of a state from the Union. The idea of secession appeared at many times during the early years of the republic, and the right of secession was conceded by many. Every important change in policy gave opportunity for the minority party to suggest secession as a means of compelling the party in power to change its course. It was suggested at the Louisiana Purchase, at the War of 1812, at the passage of the tariff of 1828 and at various times during the slavery controversy. In 1860, after the election of Abraham Lincoln as President, secession was actually carried out, eleven Southern states seceding and forming the Confederate States of America. This brought on the War of Secession, or Civil

War, since which the union has been considered inviolable. See CIVIL WAR IN AMERICA; CONFEDERATE STATES OF AMERICA; UNITED STATES, subhead *History*.

SECORD, LAURA, a Canadian heroine. During the War of 1812 a force of Americans sought to surprise a small British force at Beaver Dam. News of this plan reached James Secord, a wounded militia officer then living in Queenstown.

As he himself was unable to warn the British commander, his wife undertook the dangerous mission. Driving a cow before her until she reached the woods, in order that the enemy might not suspect her purpose, she then set out on her solitary tramp of twenty miles through the dense forest. After an exhausting day, during which she was



THE LAURA SECORD MONUMENT, AT LUNDY'S LANE CEMETERY

in constant danger from hostile Indians and Americans, she brought the news to the defenders of Beaver Dam. The British forces were now prepared for attack and when the Americans approached, the English immediately took the offensive and forced the Americans to surrender. While the battle in itself was not of great significance, it will live in history for the heroism of Laura Secord.

SECRETARY BIRD, a South African bird of prey, deriving its popular name from the peculiar plumes which project from the back and sides of its head, giving to it the appearance of having bundles of old-fashioned quill pens stuck behind each ear. The bird has very long legs, and its stands nearly four feet in height. Though somewhat resembling a heron in general appearance, it is more closely related to the vulture, and as it kills rats, mice, troublesome insects and even snakes, it is protected by law.

SECRETARY OF STATE. See STATE, DEPARTMENT OF.

SECRETION, in animal physiology, the separation of certain substances from the blood and the forming of them into special fluids, such as bile, saliva, mucus. Secretion is the work of organs of various form and

structure, but all may be classified as membranes or glands. Secretions are of two kinds, those that have a special work to do, known as *true secretions*, as the saliva and bile; and those that are discharged from the body as worthless or harmful, known as *excretions*. The latter require no special cells, as they exist in the blood and must be separated from it. If an excretory organ becomes useless, some other organ will do its work, but if an organ of secretion be removed, its product is no longer found in the system. See GLANDS; MEMBRANES.

SECRET SERVICE, that branch of the government whose duty it is to detect criminal and fraudulent practices against the government. In most foreign governments this service is in the hands of a separate department, but in the United States each of the several executive departments has its own secret service. The most important divisions are those connected with the Treasury and the Department of Justice. The Treasury division is engaged chiefly in the detecting and arresting of coin and note counterfeiters and in preventing the violation of revenue laws.

The duties of the division connected with the Department of Justice consist in detecting plots against the government, and in discovering and arresting those who persist in violating the laws of the United States in other ways than by defrauding the government financially. During the World War the labors of this division were very strenuous, and the skill displayed by its members in detecting German propaganda, and in discovering and arresting German agents proved the high degree of efficiency which the Secret Service in the United States has attained.

SECRET SOCIETIES. See FRATERNAL SOCIETIES.

SECULAR GAMES, a festival anciently celebrated at Rome at irregular periods and not, as their name would seem to indicate, at the commencement of a new *sacculum*, or generation. Nothing of their origin is known except that they were celebrated in honor of Pluto and Proserpina, to avert from the state some imminent catastrophe. Down the ages long intervals elapsed between the various celebrations.

SEDA'LIA, Mo., the county seat of Pettis County, 100 miles east of Kansas City, on the Missouri, Kansas & Texas and the Mis-

souri Pacific railroads. The city is situated on a plain almost a thousand feet above sea level, in an agricultural region containing, also, deposits of zinc, iron, lead, fire clay, emery and limestone. Repair shops of the Missouri Pacific are located here; these employ nearly 2,000 men. There are also foundries, machine shops, implement works, woolen mills, a meat-packing plant, flour mills, grain elevators, broom factories, a clothing factory and manufactories of agricultural implements. The principal structures are a Federal building, courthouse, high school, municipal buildings, a Y. M. C. A., a Carnegie Library, a railroad hospital and two that are private. The city has a telegraph school, George R. Smith College for colored students, a convent and other institutions. The city was laid out by General George R. Smith in 1861, and was a military post during the Civil War. It was incorporated in 1864, and was chartered as a city in 1889. Population, 1910, 17,822; in 1917, 19,711 (Federal estimate).

SEDAN, *se dah'n'* BATTLE OF, the decisive battle of the Franco-German War, fought September 1, 1870, at Sedan, a fortified town 164 miles northeast of Paris. Marshal MacMahon, on his way to relieve Bazaine at Metz, was forced by the Germans to take refuge in the fortress of Sedan, which was then surrounded by the enemy. The French issued from their position and began battle; driven back to the town of Sedan, after gallant fighting they were finally forced to surrender. Emperor Napoleon III and over 85,000 men were made prisoners. It was the capture of Sedan which led to the overthrow of the Second Empire in France. See FRANCE, subhead *History*; FRANCO-GERMAN WAR.

SEDATIVE, *sed'a tiv*, a drug which has a quieting influence upon a part or the whole of the nervous system or any of the organs of the body. General sedatives include chloroform, ether and the hypnotics; local sedatives are cold, heat, cocaine, opium, aconite, etc. Sedatives vary in their effects. In many instances drugs that act as sedatives upon one organ are irritants upon another; and often when small doses are sedatives, large doses excite or irritate. See NARCOTIC; ANESTHETIC, and various articles on the drugs.

SEDGES, *sej'es*, a term promiscuously applied to many marshy plants which look like

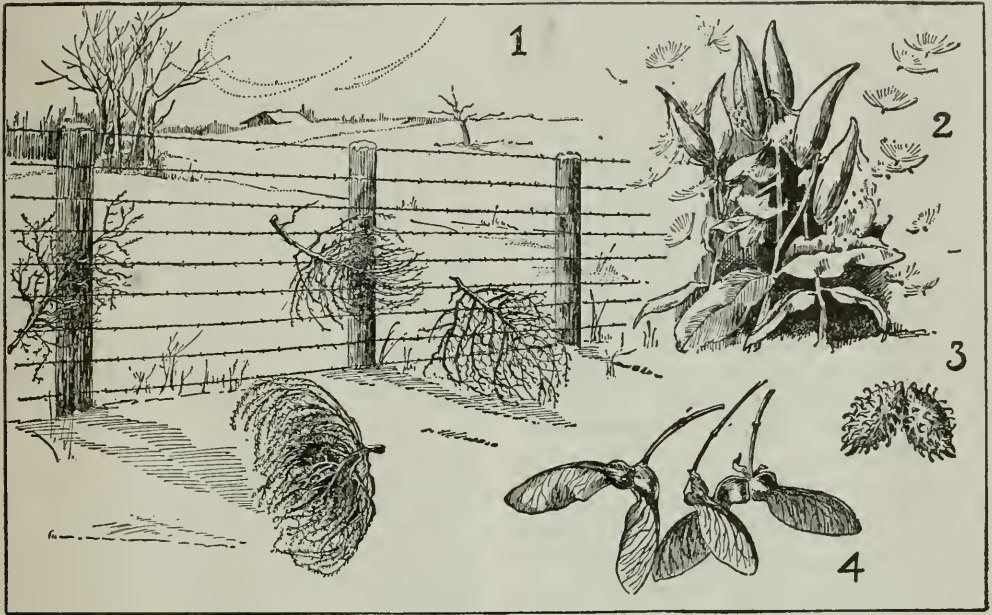
grasses but differ from them in having triangular stems, and in their flowers, which resemble minute lilies in form and structure. Most of the hay cut in swampy places is made up of sedges, which are not as succulent nor as nutritious as the grasses. There are numerous species of the sedge, distributed throughout all parts of the world, so nearly alike that only botanists can distinguish them. The Egyptian papyrus belongs to this family.

SEED DISPERSAL. If no seeds ever grew except those that are gathered and carefully planted, only a very small part of the earth would have green things growing upon it. But fortunately for the plants, most of them do not have to depend on people to carry their seeds about. They are provided with all kinds of ingenious apparatus to do the work for them. If the tiny dandelion seed had to depend upon itself it would never get far; it would probably stay on the head of the stalk until that withered, and then it would fall to the ground. But the dandelion seed has white, feathery wings. A puff of wind takes up a number of the seeds with their feather tops and carries them away, sometimes perhaps, bearing them for miles before it drops them. The thistle and the milkweed seed have the same kind of little white hairs, which help them to find their way about. The elm and the ash and the maple have winged fruits, but these wings are different. They are made of a sort of membrane which looks more or less like the inside wing of a grasshopper. However, they do just the same duty as the fluffy wings of the milkweed—they help the wind to carry the seed and scatter it everywhere. Those who live in the country where there are open stretches may see dried-up plants, rolled up almost into a ball, blowing about the prairies and piling themselves up by fences. These plants, which have broken off near the ground, are known as tumbleweeds, and they are doing just what the pansy does when its seed-pods shoot open—scattering their seed. The seeds are held rather firmly by the plant, so that they do not all fall out at once, but are strewn over long distances. This is the way the Russian thistle and the pigweed and the ticklegrass spread themselves over so much ground, for those three troublesome plants are all tumbleweeds. The seeds of the cocklebur are in the burs, and when those troublesome things stick to people or to animals the seeds are scattered. All the other kinds of

bur plants, the sand bur, the sticktight, the burdock, have their seeds carried about for them in the same manner.

In these ways and in other ways seeds are scattered, and if all plants that spring from

Seed Construction. Each seed consists of an embryo and a supply of food, protected by a more or less hardened coat. The embryo is a minute plant, one part of which has the power to grow upward to the light and air,



SEED-SCATTERING DEVICES

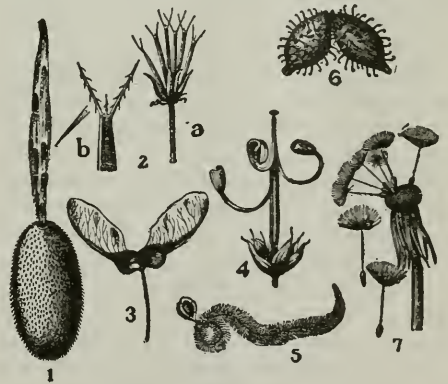
1. Tumbleweed. 2. Milkweed. 3. Cocklebur. 4. Winged seeds of maple.

seeds matured the earth would be choked with vegetation. For example, a morning-glory has just about an average number of seeds—three thousand to a single healthy plant. If all of these seeds were planted, and grew, there would be nine million plants the next year. The following year there would be twenty-seven billion plants, and the year after that eighty-one trillion. At this rate it would not take the descendants of a single morning-glory very long to cover much of the earth. Indeed, it is a well-known fact that if there were no check to the growing of plants, the whole surface of the land would soon be covered with vegetation denser than that in the thickest tropical jungle—so dense that men and animals could not get through. In the struggle for existence, however, the weaker plants are crowded out, and a proper balance is maintained. See BOTANY.

SEEDER. See SOWING MACHINE.

SEEDS, the name in botany given to the ripened ovules of plants. Sometimes they are called "plant babies," as each contains the nucleus of a tiny plant.

where it develops leaves and flowers; the other part has the power to develop roots, which grow downward into the darkness of the soil in search of food and moisture. In



SEEDS

1, squirting cucumber; 2, bidens; a, the full head b, fruit enlarged; 3, maple; 4, geranium; 5, clematis; 6, cocklebur; 7, dandelion.

the seed the food supplies are in some cases placed around the embryo, while in others they are stored in the embryo itself. The

coverings of the seeds are so marked that a person knowing them can easily recognize the species from which they came.

Some seeds are hard and dry, or stony; others develop appendages, such as wings, or silky hair, evidently intended to aid in their distribution. In a few species there is an extra covering, called an *aril*, which is either fleshy or sacklike, as may be seen in the mace of a nutmeg.

Seed Testing. To secure the best prospects for a good crop, successful farmers test their seeds before planting. Professor Nobbe established the first laboratory for testing seeds at Tharand, Saxony, in 1869. Since that time laboratories have been established in most European countries, where in numerous instances the quality of the seed is under governmental control. Seed testing laboratories are found in the United States in connection with the national Department of Agriculture and many individual state experiment stations.

A simple device for seed testing consists of two plates of the same size. A piece of blotting paper marked off into squares two inches in diameter is placed in one plate. Enough water is poured into the plate to moisten the paper, and ten seeds to be tested are dropped in each square. Over these another piece of blotting paper, on a damp cloth, is placed, and this is covered by turning the second plate over the first. The blotter must be kept moist, and the plates set where the temperature will be about the same as that of the soil at the time of planting. In eight or ten days the seed should have germinated (sprouted). The number of seeds that have germinated in each square should be counted, and thus the percentage of good seed in the lot from which the seeds were taken is estimated. See SEED DISPERSAL.

SEEGER, ALAN (1888-1916), an American poet who made one of the most notable contributions to the poetry of the World War in his splendid lyric, *I Have a Rendezvous with Death*. He was born in New York City, but spent part of his boyhood in the City of Mexico. In 1910 he was graduated at Harvard University, and two years later went to Paris, where he continued to write poetry, which had been begun in his college days. In August, 1914, shortly after the outbreak of the World War, he enlisted in the Foreign Legion of France. The young poet spent many weary months in drilling

and becoming inured to the monotony of trench life, but in the spring of 1915 he took part in the Battle of Champagne. After this engagement his regiment passed to the rear and was not sent to the front until May, 1916. On July 4 the Legion was ordered to clear the enemy out of the village of Belloy-en-Santerre, and in the first advance Seeger fell wounded. The next morning his dead body was found on the battlefield.

Alan Seeger's poems were published in America in December, 1916. They include his early verse, entitled *Juvenilia*, a number of sonnets and translations of Italian classics, and his war poems. His most famous lyric appears below. Another notable poem, *Ode in Memory of the American Volunteers Fallen for France*, was written in two days in the midst of trench hardships.

The poem that immortalized Seeger is given in full below:

I have a rendezvous with Death
At some disputed barricade,
When Spring comes back with rustling shade
And apple blossoms fill the air—
I have a rendezvous with Death
When Spring brings back blue days and fair.

It may be he shall take my hand
And lead me into his dark land
And close my eyes and quench my breath—
It may be I shall pass him still.
I have a rendezvous with Death
On some scarred slope of battered hill,
When Spring comes round again this year
And the first meadow-flowers appear.

God knows 'twere better to be deep
Pillowed in silk and scented down,
Where Love throbs out in blissful sleep,
Pulse nigh to pulse, and breath to breath,
Where hushed awakenings are dear. * * *
But I've a rendezvous with Death
At midnight in some flaming town,
When Spring trips north again this year,
And I to my pledged word am true,
I shall not fail that rendezvous.

SEIDLITZ, *sed'lits*, POWDERS, a medicine, named after the Seidlitz spa in Bohemia. These powders are usually put up in blue and white papers, the blue containing tartrate of soda and potash (Rochelle salt), with bicarbonate of soda; and the white, tartaric acid. The contents of the blue paper are dissolved in half a tumbler of water, and the acid powder is then added. The draught is taken during the effervescence, which begins at once. The medicine is mildly laxative.

SEIGNIORAGE, *seen'yer ayj*, a royalty or prerogative of the sovereign whereby an allowance of gold or silver, brought to a mint

in the mass to be exchanged for coin, is claimed. In modern times the meaning has not changed. Any person owning gold in any form may take it to a government mint and exchange it for gold coin, ounce for ounce, except that enough is deducted to pay for coining the bullion. This deduction is seigniorage.

SEINE, *sayn*, the most picturesque river of France and its most important trade route. The city of Paris lies on its banks. It rises in the department of Côte-d'Or, flows north-northwest and enters the English channel between Havre and Honfleur. Because of its circuitous course, it is 475 miles long, and it is navigable for 350 miles. Its mouth is an estuary six miles wide, where is situated the city of Havre. To enhance its commercial value numerous locks and canals have been constructed to connect it with the Scheldt, the Meuse, the Rhine, the Rhone and the Loire. Within recent years the Seine has at times overflowed its banks, and Paris has suffered severely from floods.

SEISMOGRAPH, *size'mo graf*, an instrument for measuring the force and direction of earthquakes and other earth movements. The essential part of a seismograph is a pendulum so delicately suspended that it is unaffected by earth movements. The record is made by the movement of the surface beneath it. Some types of the apparatus are so constructed that the record is produced photographically upon a moving piece of sensitized paper or film; others are so made that a stylus traces the record on smoked paper attached to a movable cylinder. So sensitive is this delicate little instrument that it can record at Rio Janiero earth disturbances in Japan, on the opposite side of the globe.

SELENE, *se le' ne*, in Greek mythology, the goddess of the moon, daughter of Hyperion and Thea and sister of Helios (the sun) and Eos (the dawn). She was also called Phoebe, and in later times was identified with Artemis. In art she was often represented as a beautiful woman with large wings and a flowing robe, and wearing a coronet.

SELENIUM, a rare chemical element, discovered by Berzelius in 1817 in the refuse of a sulphuric acid manufactory near Fahlun, in Sweden. It occurs in several minerals, chiefly in combination with sulphur, copper, lead, mercury and silver, and is closely related in its general chemical properties to sulphur and tellurium. Selenium takes fire

when heated to a tolerably high temperature in air or in oxygen, burning with a blue flame and a disagreeable odor. With hydrogen selenium forms the very disagreeably smelling gas, *seleniureted hydrogen*, the analogue of *sulphuretted hydrogen*. In metallic form it is a conductor of electricity, the power of which is increased by sunlight.

SELF-DENYING ORDINANCE, *aw'r di-nans*, an enactment passed by the British Parliament in 1645, decreeing the resignation of all members of that body who had held any civil or military office during the Civil War between Charles I and Parliament. Its object was to remove inefficient commanders for the remodeled army and to give control of the army to radical Independents rather than to Presbyterians. Cromwell, who was a member of Parliament and an officer in the army, was excepted and reappointed to the command of the cavalry as lieutenant-general.

SELJUKS, *sel jooks'*, a Turkish dynasty very powerful in Asia in the eleventh and twelfth centuries, so named after Seljuk, a chieftain of the Ghuz Turks. Persia was conquered by the Ghuz Turks in 1030, and this formed the nucleus of the empire, which later extended over Armenia, Turkestan, Syria and Asia Minor. In the First and Second Crusades, the Christians came into conflict with the Seljuks because of their cruelty toward pilgrims to the Holy Land (see **CRUSADES**). The Seljuk dynasties held sway until the end of the thirteenth century, the Ottoman Empire in Asia being founded upon the ruins of the Seljuk Empire. Omar Khayyam (which see) flourished during the period of Seljuk supremacy.

SELKIRK, ALEXANDER (1676-1723), a Scotch adventurer, whose experiences on an uninhabited island inspired the story of *Robinson Crusoe*. He took part in buccaneering expeditions in the Southern Pacific, and in consequence of a quarrel with his captain he was put ashore, at his own request, on the island of Juan Fernandez, off the coast of Chile. There he lived alone for four years and four months, until he was rescued by the captain of a privateer. He returned home in 1712, and his adventures became known to the public. He afterward rose to the rank of lieutenant in the navy. Defoe's *Robinson Crusoe* appeared in 1719, but Crusoe's experiences have but little in common with those of Selkirk. See **ROBINSON CRUSOE**; **JUAN FERNANDEZ**, for illustration.

SELKIRK MOUNTAINS, a range about 200 miles long and eighty miles wide, situated in the southeastern part of British Columbia and noted for its great glaciers and the rugged magnificence of its scenery. The range is west of the Rockies and extends from the United States boundary to the great loop of the Columbia River. Its highest peaks are Mount Sir Sandford, 11,634 feet, and Mount Sir Donald, 10,645 feet. Gold, silver, copper, zinc, mercury, coal and marble have been found here. The range has been named in honor of Thomas Douglas, Earl of Selkirk (which see).

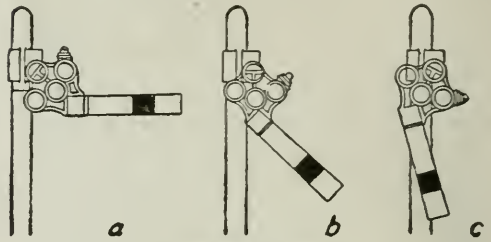
SEL'MA, ALA., the county seat, of Dallas County, fifty miles west of Montgomery, on the Alabama river at the head of navigation, having two steamers weekly to Mobile. It is on the Louisville & Nashville, the Southern, and the Western of Alabama railroads. The city is in a cotton-growing region and contains cotton, cottonseed-oil, flour and planing mills, railroad shops, machine shops and other factories. The Alabama Baptist Colored University is located here, and the city has Dallas Academy, a Carnegie Library, a Y. M. C. A. and a county courthouse. There is a fine bridge across the river. The first settlement was made in 1823. Population, 1910, 13,649; in 1917, 15,945 (Federal estimate.)

SELVAS, *sel'vas*, a stretch of dense woodland plains of the Amazon Valley, in South America, extending from Northern Brazil to the southern part of Venezuela. Brazil-nut, cacao, wax-palm, and other varieties of trees grow in abundance amid dense tangles of cacti, orchids and creeping tropic vines, while from this great forest Brazil exports in addition to many kinds of valuable wood, immense quantities of rubber and bamboo.

SEMAPHORE, *sem'a for*, a device used for signaling in navies, in the army and on railroads. Before the invention of the telegraph, many kinds of semaphores were in use, but electric communication now has rendered them unnecessary in many instances.

The simplest form of semaphore is that employed on railways. It consists of an upright standard, from three to eighteen or twenty feet in height, as conditions necessitate, to the top of which one or more boards, called *arms*, are attached. These arms are fastened to the standard so they can be raised or lowered from the office of the telegraph operator. The long arm is usually painted red or white, and the short arm contains an

iron frame, in which are placed red and green glasses, one above the other. When the arm of the semaphore is dropped, it indicates a clear track; if raised to an angle of 45°, it



SEMAPHORE

a, stop; b, caution, go slowly; c, way clear, go ahead.

indicates caution; if raised to a horizontal position, it indicates that the train should stop. At night the colored glasses in the short arm give the necessary signals. When the arm is dropped, a white light is shown; at an angle of 45°, a green light; and when in horizontal position, a red light. See RAILROAD.

SEMBRICH, *zem'brik*, MARCELLA (1858-), an operatic soprano whose real name is MARCELLINE KOCHANSKA, was born at Lemberg, in Galicia. At first she studied violin and piano, but upon the discovery of her remarkable voice, she began to study at Milan. After a successful operatic debut at Athens in 1877, she became the leading soprano in the Dresden court theater, where she remained until 1880. During the next five years she received great ovations in her frequent concert tours to England and America. Since 1889 she has resided in Dresden, continuing her public work, largely in recitals in Europe and America, although appearing as the leading soprano for several seasons at the Metropolitan Opera House, New York. Critics have accorded Sembrich unanimous praise for the purity and flexibility of her voice.

SEMELE, *sem'e le*, in Greek mythology, a daughter of Cadmus, beloved by Jupiter. Jealous of her husband, Juno persuaded Semele to entreat her lover to attend her with the majesty in which he appeared on Olympus. As he had sworn to gratify her every wish, Jupiter, though horrified at this request, came to her accompanied by lightnings and thunderbolts, which were too powerful for a mortal, and Semele was instantly consumed by fire. Bacchus, the god of wine, was her son by Jupiter.

SEMINOLE, *sem'inohl*, a Muskogean tribe of Indians who originally lived in Florida. They consisted chiefly of immigrants from the Lower Creek towns on the Chattahoochee River, and took their present name about 1775. The Seminoles first came into conflict with the United States in 1817, when General Andrew Jackson invaded their territory. After the cession of Florida to the United States in 1819, a treaty was made with them providing for their removal west of the Mississippi River, but a large number, under the leadership of the celebrated Osceola (which see), refused to be bound by the treaty. Their heroic efforts to hold their territory and to prevent themselves from being removed west of the Mississippi were so successful that it was only after a war of seven years (1835-1842), which cost the United States \$10,000,000 and 2,000 lives, that the Seminoles were transported to what is now Oklahoma and finally settled there, where their descendants are American citizens. A few still remain in Florida, where they are to be placed on a small reservation, because of the draining of the swamps.

SEMIRAMIS, *se mir'a mis*, a queen of Assyria, whose history is a mingling of fact and fable. Tradition credits her as the founder of Babylon and the conqueror of Persia and Egypt. According to the story, she was a daughter of the fish goddess Derceto by a Syrian youth. When deserted by her mother, she was fed by doves until discovered by the chief of the royal shepherds, who adopted her. Her beauty attracted King Ninus of Assyria, who made her his wife. Upon the death of her husband she reigned gloriously for forty-two years, when she was deposed by her son, when she disappeared. The hanging gardens of Babylon are attributed to her. Catharine II of Russia was called the Semiramis of the North.

SEMITES, *sem'ites*, who together with the Hamites and the Aryans constitute the three great divisions of the white race, are a west-Asiatic group of people, including the Hebrews, Assyrians, Chaldeans, Carthaginians, Arabians, Babylonians, Phoenicians and various other peoples, closely akin in physical and mental characteristics, religion and language. The name is derived from that of Shem, the son of Noah, but is not rightly applied to all of the peoples who are given in *Genesis X* as the descendants of Shem. Judaism, Christianity and Mohammedanism

had their origin with the Semitic races; our alphabet comes from the Phoenicians.

SEMITIC LANGUAGES form an important linguistic family, usually divided into a northern and a southern section. The northern group includes the ancient dialects of Assyria and Babylonia (recovered by means of the cuneiform inscriptions), the Hebrew, the Phoenician and the Aramaic. Of these, the Hebrew alone is extant as a spoken language. The most important of the south Semitic tongues, and the only one now in extensive use is the Arabic. To this southern branch belongs also the Ethiopic, or ancient ecclesiastical language of Abyssinia. The greatest literary attainments of the Semites are the Bible and the Mohammedan *Koran*.

Related Articles. Consult the following titles for additional information:

Alphabet	Hebrew Language
Christianity	and Literature
Cuneiform	Jews
Inscriptions	Mohammedanism

SEMMES, *semz*, RAPHAEL (1809-1877), an American naval officer who commanded the *Alabama*, the famous Confederate vessel of the Civil War, was born in Charles County, Md. He entered the navy in 1832, having previously studied law, took part in the Mexican War, and at the outbreak of the Civil War joined the Confederate service. As commander of the *Sumter*, and later of the *Alabama*, he captured many prizes (see ALABAMA, THE). Semmes was later placed in charge of the James River squadron. He was imprisoned after the war, but gained his liberty at the amnesty. He then devoted himself to his law practice and to the writing of several books, notably *Service Afloat and Ashore*, *Cruise of the Alabama and Sumter* and *Campaign of General Scott in the Valley of Mexico*.

SENATE, originally the supreme legislative body of ancient Rome, first instituted, according to tradition, by Romulus. Under the Republic the consuls, the consular tribunes and the censors had the power of choosing the senators; but they were restricted to those who had previously held magistracies, and as the magistrates were chosen by popular election, the senate was ultimately a representative body. In the administration of affairs the senate was supreme, and during national crises it could invest the consuls with absolute and dictatorial authority. Its numbers varied from 100 to 1,000, being often increased or diminished to suit the wishes of various emperors and dictators.

In modern times the term is applied to the upper, or less numerous, branch of the legislature in various countries, as in the United States, Canada, France, in most of the separate states of the Union and in some of the Swiss cantons. It is also used to designate the governing body of certain universities. See below.

SENATE OF THE UNITED STATES, the upper and smaller branch of the national Congress. The Constitution of the United States, in Article I and in Amendment XVII, states the fundamental law under which the body is organized.

There are two Senators from each of the forty-eight states of the Union. It was intended that they should represent the states in Congress; therefore the Constitution placed upon the state legislatures the duty of electing them. The Seventeenth Amendment, adopted in 1912, took this privilege from the legislatures and vested their election directly with the voters. They yet represent the sovereign states, but are probably more responsive to the wishes of the people by the present manner of election. The term of a Senator is six years; one-third of the Senators retire every two years, on the 4th of March, so the Senate, unlike the House of Representatives, is a continuous body.

The powers and duties of Senators are coordinate with those of Representatives, in most respects. The Senate cannot originate revenue bills, the initiative resting with the House. It has the sole power to sit as a court to try impeachment cases after the House has voted impeachment of an officer of the government. The Senate is one arm of the treaty-making power of the government, for it must approve all treaties made by the executive department before they can become effective. In other respects the powers of the two houses are equal.

The presiding officer of the Senate is the Vice-President of the United States. Not being a member of the body, he can vote only in case of a tie. The Senators choose one of their own members, known as president *pro tempore*, to preside when the Vice-President is absent. The salary of the president *pro tempore* is \$12,000, the same as that of the Vice-President; all other Senators receive \$7,500.

Related Articles. Consult the following titles for additional information:

Congress	Representatives,
Constitution of the	House of
United States	Vice-President

SENECA, *sen'e ka*, a tribe of American Indians, who when first known inhabited the western part of New York state between Seneca Lake and the Genesee River. They were the largest and most powerful tribe in the Iroquois federation known as the Five Nations (which see). They conquered the Erie and the Neutral Nation and absorbed the remnants of those tribes, about 1650, then extended their settlements into the country west of Lake Erie and southward along the Allegheny River. In the Revolutionary War they supported the British. About 2,500 now live on their reservation in New York, and a few are found in Oklahoma and Ontario. They have adopted the dress and customs of civilization.

SENECA, LUCIUS ANNAEUS (about 4 B. C. -A. D. 65), a Roman philosopher who taught the doctrine of the Stoics, and one of the most brilliant men of letters of his time. He was born at Corduba (Cordova). When quite young he studied in Rome, where he made rapid advance under the tuition of his father. On his recall from Corsica, where he had been banished for eight years, he was made praetor, and was appointed one of the tutors of Emperor Nero. For a few years Seneca exerted a strong influence over his wayward pupil, but eventually only jealousy and hatred were engendered. After Nero had drawn Seneca into a conspiracy, he was forced by Nero to commit suicide. Seneca's extant works comprise moral treatises on *Anger*; on *Providence*; on *Tranquillity of Mind*; on the *Steadfastness of the Wise Man*; on *Clemency*, addressed to Nero; seven books on *Benefits*; seven on investigations of nature, and twenty books of moral letters. The tragedies which bear Seneca's name are inferior to his prose writings. See STOICISM.

SENECA LAKE, the largest of the group known as the Finger Lakes, in the western part of New York, and a favored summer resort because of its scenic attractions, notably Watkins Glen and Cayuga Lake Park. The lake is thirty-seven miles long, from two to four miles wide, and 630 feet deep. Seneca Lake flows into Lake Ontario, through Seneca and Oswego rivers, and is joined by a canal to the Erie canal. See NEW YORK STATE BARGE CANAL.

SENEGAL, *sen e gaw'*, a river of Africa, on the southwestern border of the Sahara Desert. It rises near the sources of the Niger, from which its sources are separated

by the highlands of the Mandingo country. Its course is northwest and west through the Senegambia and Niger territories, and it enters a lagoon on the Atlantic Ocean near the town of Saint-Louis. The river has two picturesque cataracts, Guine and Felu. The basin drained by the Senegal is hot and unhealthy. About 700 of its 1,000 miles are navigable, but much of its course is dangerous to shipping.

SENEGAL, a French colony in West Africa, extending from the Gambia River on the south to the Senegal on the north, and from the Atlantic Ocean eastward somewhat indefinitely. It has an area of about 74,000 square miles and a population of about 1,250,000, of which 4,600 are whites. The region is mostly low, and in some sections the soil is unfertile, but in some portions of the Senegal Valley there are luxuriant forests. The climate is hot and unhealthy. The products consist of coconuts, rubber, raisins, millet and maize. The capital is Saint-Louis which is connected by railway with Dakar and Rufisque. There are no manufactures, and the commerce is comparatively unimportant. See FRENCH WEST AFRICA.

SENEGAM'BIA, a territory in West Africa, now known as Senegal (which see).

SENNACHERIB, *seh nak'e rib*, an Assyrian king, son of Sargon, who reigned from 705 to 681 B. C. He suppressed the revolt of the Babylonians, reduced part of Media, exacted tribute from Tyre and other Phoenician cities, advanced upon Philistia and Egypt and finally proceeded against Hezekiah, king of Judah, who had revolted. Yielding to panic, Hezekiah paid the tribute exacted, but when Sennacherib again invaded Judah, a miraculous visitation caused the death of thousands of his troops. Sennacherib built the embankment of the Tigris and made canals and water courses, but his architectural triumph was the palace of Koyunjik, which covered eight acres.

SENSATION, a mental impression received through the excitation of a sensory nerve. The conditions necessary to a sensation are (1) a stimulus acting upon the ends of a sensory nerve; (2) the transmission of this stimulus to the nerve center with which the excited nerve is connected; (3) reaction of the brain upon the stimulus. Sensations are divided into two classes, general and special. General sensations are those which are related to the welfare of the body and serve

as warnings or stimuli to action. Hunger, thirst and fatigue are good illustrations. Special sensations are those received through the organs of special sense and are more directly connected with mental states than are general sensations.

Intensity. The intensity of a sensation depends upon two classes of conditions—those which are external and those which are internal. The external conditions are (1) the intensity of the stimulus; for instance, the sensation from the light of a candle is not as intense as that from an electric light; (2) the mass or amount of the stimulus; a boy derives more pleasure from a spoonful of sugar than from a few grains; (3) newness of surroundings; because everything is new to him the child has stronger sensations from a certain stimulus than does the adult; (4) prolongation of the stimulus; the intensity is weakened by the prolongation of the stimulus beyond a given time. An odor which is at first keen is scarcely perceived after a few moments. Looking continually at a bright object fatigues the eye, and the color appears more dim, and listening continually to a monotonous sound lessens its intensity.

The internal conditions are (1) attention; sensation becomes more vivid if we give it our attention; (2) condition of mind and body; sensations are weakened by weariness and by some diseases, while they are sometimes intensified by such diseases as irritate the nerves; (3) contrast; sudden changes from one extreme to another increase the intensity, as in passing from a dark room to one brilliantly lighted, or in the hearing of a loud sound when one is in quietude.

Development. At birth the organs of special sense are dormant, and they develop slowly. The best authorities consider touch as the fundamental sense, and it is the one earliest developed. Taste and sight follow closely, and the development of touch aids in their perfection and makes them more acute. While taste and smell are inseparable in the act of tasting, the sense of smell is of later development than the sense of taste. Hearing is developed later than the other senses, but next to sight it is the sense which gives us the widest range of knowledge.

Since each sense produces its own peculiar sensations, it follows that all senses should be trained. The training of the eye and ear to the neglect of touch, taste and smell is a serious error and deprives children of the

chance to acquire at first hand much valuable knowledge. Because sight and hearing are so easily trained, parents and teachers are prone to neglect the development of the other senses. See PERCEPTION.

SENSES, SPECIAL. The sensory nerves convey to the brain two classes of impulses, those arising from conditions within the system, such as fatigue, exhilaration, hunger, thirst and the various feelings caused by disease, and those arising from contact with external objects, which give us a knowledge of the outside world. The former are classed as *general*, and the latter as *special* sensations.

The special senses comprise those organs, sensory nerves and brain centers which respond only to special stimuli. In the order of their complexity they are (1) touch and the temperature sense; (2) the muscular sense (3) taste; (4) smell; (5) hearing, and (6) sight. The organs of special sense bring to their respective brain centers impulses which these centers alone can translate, and this translation gives us the knowledge of sight, sound, touch, etc. It is supposed by some physiologists that the impulses are all alike and that the different interpretations are due solely to the brain centers; but there is no definite knowledge as to the method by which the impulses conveyed to the brain from the different organs are translated into mental impressions. That these impressions are wholly due to the brain centers is certain. A blow on the back of the head, or the stimulation of the optic nerve by electricity will cause a sensation of light in the darkest room.

There is no sharp line of separation between the general and special senses. By the increase of the stimulus, what is a special sensation, as touch, may be changed to pain. This is well illustrated by the increase of pressure at one point on the hand. A light pressure gives rise to the sense of touch, but when increased beyond this limit, it becomes painful, and we experience the pain only. The special sensations are also evolved from the general, as their development from the lower orders of animals illustrates. All impressions arising through the nerves of special sense have a physiological and a psychological phase. These phases are explained in the article SENSATION.

Related Articles. Consult the following titles for additional information:

Ear	Smell
Eye	Taste
Nervous System	Touch

SENSITIVE PLANT, *sen'si tiv*, a plant native to south America, so called because at the approach of night or when shaken or roughly handled its leaflets fold over each other in pairs and each of the leafstalks bends toward the stem as if shrinking from its intruder. At sunrise, or when undisturbed, the leaves gradually unfold and recover their normal state. Many species of different families show similar sensitiveness in lesser degree.

SEOUL, or **SEUL**, *sa ool'*, the capital of the Japanese province of Chosen, or Korea, situated on the north bank of the Seoul River, about three miles north of the Han River and about nineteen miles northeast of Chemulpo, its port on the Yellow Sea. The two cities are connected by rail, and there is also rail communication between Seoul and the cities of Fusan and Wiju. Seoul has been the capital of Chosen over 600 years. It has the narrow streets and mean houses so common in Oriental countries, but is slowly being modernized, and now possesses electric lighting, telegraph and telephone service and electric street transportation. There are few buildings of interest besides the Roman Catholic cathedral, the ancient royal palace and a temple to Confucius. Population, 1911, 223,381. See CHOSEN.

SEP'ARATOR, CREAM. See CREAM SEPARATOR.

SE'PIA, the name of a cuttlefish, also of a pigment used by painters to produce a beautiful brown color prepared from the secretion of an organ in the cuttlefish, called the *ink bag*. The original black color is changed to brown by dissolving in caustic potash. This solution, after boiling and filtering, forms the sepia of commerce. The black coloring matter obtained from the ink bags is marketed, after undergoing several processes, as India ink. See CUTTLEFISH; INDIA INK.

SE'POY, a native British Indian soldier. The Sepoys who are of practically every race and tribe in India, have been a part of the British forces since the middle of the eighteenth century, and except at the time of the rebellion (1857) have always been loyal to England. There are now about 140,000 Sepoys in the British service, officered by both natives and Europeans. They are courageous, temperate and hard fighters and are an important part of the British army in India. See SEPOY REBELLION.

SEPOY REBELLION, *re bel'yun*, a mutiny of native troops in India which began in May, 1857. It was the result of resentment over the introduction of Western ideas, particularly the English disregard for native customs and religious beliefs. The Hindus will not taste anything derived from a pig or a cow, and consequently when the Sepoys, as the native troops are called, were ordered to use greased cartridges, they objected to biting the cartridge casings and rose in revolt. The rebellion started at Meerut, near Delhi, and spread to Delhi, Cawnpore and Lucknow, and many Europeans, including women and children were massacred. The revolt was crushed in June, 1858. The effect of the rebellion was far-reaching, one result being the transfer of the government of India from the East India Company to the crown.

SEPTEMBER, the ninth month, the month combining

"Summer's best of weather
And autumn's best of cheer."

The name is derived from the Latin word for *seven*, for in the old Roman calendar September was the seventh month. When Julius Caesar made his calendar revisions September became the ninth month, but retained its name. Then, as now, it had thirty days. About the twenty-second of the month the sun crosses the equator on its journey toward the Tropic of Cancer, and days and nights are equal all over the world. In September we look back to fading summer and forward to the falling of the leaves and other tokens of autumn. In northern climes there are occasional hot, dry September days much like those of August, but they pass quickly by, and are soon replaced by October's "golden weather." Among the wild flowers blooming in September are the fringed gentian and the wild aster. The goldenrod is September's flower emblem, and the sapphire its special gem.

Special Days for Observance. The first Monday of September is celebrated as Labor Day throughout the United States and Canada. This is the only general September holiday, but American negroes celebrate September 22, as Emancipation Day.

Anniversaries for Celebration. The following birthdays of notable people fall in September:

Peter Cartwright, September 1, 1785.
James Gordon Bennett, September 1, 1795.
Henry George, September 2, 1839.
Eugene Field, September 2, 1850.

Sarah Orne Jewett, September 3, 1849.
Pindar, September 4, 522 B. C.
Phoebe Cary, September 4, 1824.
Cardinal Richelieu, September 5, 1585.
Lafayette, September 6, 1757.
Sir Georges E. Cartier, September 6, 1814.
Jane Addams, September 6, 1861.
Queen Elizabeth, September 7, 1533.
Richard I, September 8, 1157.
Charles Dudley Warner, September 12, 1829.
John J. Pershing, September 13, 1860.
Charles W. Gordon, September 14, 1860.
Charles Dana Gibson, September 14, 1867.
James Fenimore Cooper, September 15, 1789.
Francis Parkman, September 16, 1823.
Samuel Johnson, September 18, 1709.
Alexander the Great, September 20, 356 B. C.
Louis Joliet, September 21, 1645.
Clark Howell, September 21, 1863.
Caesar Augustus, September 23, 63 B. C.
John Marshall, September 24, 1755.
Felicia D. Hemans, September 25, 1793.
Samuel Adams, September 26, 1722.
Robert Clive, September 29, 1725.
Admiral Nelson, September 29, 1758.
Pompey, September 30, 106 B. C.

The following notable events occurred in September:

Rule of India relinquished by the East India Company to the Crown, September 1, 1858.
Battle of Actium, September 2, 31 B. C.
Organization of United States Treasury Department, September 2, 1789.
New style calendar adopted in Great Britain and its colonies, September 3, 1752.
Treaty of Paris signed, September 3, 1783.
Third Republic declared in France, September 3, 1870.
First Continental Congress met in Carpenter's Hall, Philadelphia, September 5, 1774.
Mayflower sailed from Plymouth, September 6, 1620.
President McKinley shot, September 6, 1901.
Peary announced his discovery of the North Pole, September 6, 1909.
First Battle of the Marne begun, September 6, 1914.
Galveston tornado, September 8, 1900.
California admitted to the Union, September 9, 1850.
Battle of Lake Erie, September 10, 1813.
Battle of the Plains of Abraham, September 13, 1759.
American victory at Saint Mihiel, September 13-14, 1918.
Constitution of the United States signed by the Convention, September 17, 1787.
Quebec surrendered to the English, September 18, 1759.
President Garfield died, September 19, 1881.
Death of Nathan Hale, September 22, 1776.
Balboa discovered the Pacific, September 25, 1513.
Holy Alliance formed, September 26, 1815.

SEPTIMIUS SEVERUS, ARCH OF, a triumphal arch in Rome, located at the end of the Sacred Way, on the Forum. It was erected in A. D. 203 by the Senate and dedi-

cated to the Emperor Septimius Severus and his two sons, Caracalla and Geta, in commemoration of the victory over the Parthians and Arabians. The arch is seventy-five feet high and bears inscriptions and reliefs descriptive of the campaigns of Severus.

SEPTUAGINT, *sep'tu a jint*, the oldest Greek version of the Old Testament, believed to have been begun in the third century B. C., in Alexandria, Egypt, and completed before the Christian Era. Its name refers to an early belief that it was written in seventy-two days by seventy-two scholars brought by Ptolemy Philadelphus from Jerusalem. The oldest existing copies are still used by scholars for criticism and comparison of the text with other versions of the 'Old Testament.

SEQUOIA, *se kwoi'a*, large trees belonging to the cypress family, found on the Coast Range and the Sierra Nevada mountains in California and Oregon. There are but two species, one popularly known as the *big tree*, the other as the *redwood*.

The Big Trees. This name is given to a number of trees found only on the western slope of the Sierra Nevadas in California. These trees grow in groups, popularly called groves, and stand amidst smaller trees of different kinds. The Mariposa grove, sixteen miles south of Yosemite Valley, is now a part of Yosemite National Park. Another national park, the Sequoia, contains over 1,000,000 of the big trees; an area of 2,560 acres about General Grant Tree is also a national park (see PARKS, NATIONAL).

The average height of the big trees is 275 feet; a number, however, attain 300 to 325 feet. The average diameter is twenty feet, though the largest trees measure twenty-five and thirty feet. The trunk is straight and slightly tapering, bearing on the upper half or third a crown of branches. Branches are seldom found below 125 or 150 feet. The bark of the old trees is cinnamon-red, and is reddish-purple on the young. It has an average thickness of eleven or twelve inches, but on some of the largest trees it is two feet in thickness and is deeply grooved and very rough. As the bark does not burn readily, it serves to protect the trees from forest fires. The branches are short and thick, and divide into tufts of fine spray which bear short, flat leaves, closely crowded together. The fruit is a cone about two inches long and one and one-half inches in diameter, each of which

produces many tiny seeds. The wood is soft and of a slightly reddish hue.

Examples of Size. In 1854 one of the big trees was cut down. The task was accomplished by boring off the trunk with augers, and it took five men twenty-two and one-half days to accomplish the work. A pavilion was built on the stump, which is now used as a dance hall, affording ample room for twenty couples on the floor and for the musicians and a fair number of spectators.

Another fallen tree in this grove was over 400 feet in height and measured 30 feet in diameter at its base. The heart has been burned out, and a man can ride through the hole in the trunk on horseback for a distance of ninety feet and emerge through an opening caused by the breaking off of a limb.

In the Mariposa grove a roadway has been cut through one of the standing trees, the tunnel being wide enough to afford ample room for the largest coach; yet this does not seem to have affected the strength or life of the tree.

Age and Tradition. The age of the big trees is not definitely known. They are probably the oldest living objects upon the earth, the largest being estimated to be from 2,500 to 3,000 years old—over six hundred years of age at the birth of Christ. According to Indian belief, the big trees alone were especially created by the Great Spirit; all other trees of the forest grew just like other plants. The genus was named in honor of Sequoyah, a half-caste Cherokee Indian who invented an alphabet for his tribe.

Redwood. Like the giant sequoias, the redwoods attain heights of 250 to 300 feet, with diameters often of fifteen feet. These trees are found on the Pacific side of the Coast Range in California and Southern Oregon, and are the most valuable timber trees west of the Rockies. The redwoods are being felled faster than the big trees, as they are more accessible. Redwoods send up suckers from the stumps and seed themselves, which obviates the danger of forest depletion; this is not characteristic of the big trees.

SERAGLIO, *se ral'yo* (properly, SERAI), the palace and its surrounding buildings formerly serving as the royal palace of the Turkish sultan at Constantinople. As it has not been used by the sultan since 1839, it is falling into ruin. Situated on a point of land projecting into the sea, its walls embrace a circuit of about nine miles, including several

mosques, the museum of Constantinople, the harem, and buildings capable of accommodating 20,000 men. Among the Turks the name is often used to designate any residence of the sultan.

SERAJEVO. See SARAJEVO.

SERAPIS, *se ra'pis*, an Egyptian deity, compounded of the names Osiris and Apis, introduced into Egypt in the reign of Ptolemy I. A magnificent statue of Serapis, doubtless originally a statue of Jupiter, was built at Alexandria in a temple called the Serapeum, the last hold of the pagans in that city after the introduction of Christianity. The Egyptians never acknowledged Serapis in their pantheon; he was the principal deity in the Greek and Roman towns of Egypt. Forty-two temples are said to have been erected to him in Egypt under the Ptolemies and Romans. His worship extended also to Asia Minor and was introduced into Rome by Antoninus Pius. The image of Serapis perished with his temple at Alexandria, destroyed in 389 by the order of Theodosius.

SER'APIS, THE. See BON HOMME RICHARD.



SERBIA, *sur'bi a*, one of the states of the Balkan Peninsula, proclaimed an independent kingdom in 1882. In 1914 this small Slavic nation was attacked by Austria-Hungary, and in the great international conflict which followed it suffered more than any of the other belligerents except Belgium. Overrun by Austrians, Germans and Bulgarians, its people subjected to all the horrors of famine, deportation and the other calamities of invasion, Serbia was a physical and economic ruin by the end of the World War, in 1919. Its reconstruction as a division of the Jugo-Slavic nation is one of the many problems awaiting solution in troubled Europe. The Serbs are Slavs, and belong to the group known as Southern Slavs, who are striving to erect a new nation representing a union of Serbs, Montenegrins, Slovenes and Croatsians. Such a union was made possible by the dissolution of the Austro-Hungarian monarchy and the defeat of the Germanic alliance.

Area and Population. At the outbreak of the World War, in 1914, Serbia had an area of 33,891 square miles, about 850 square miles greater than the area of Maine. According to the boundaries then existing, it lay between Austria-Hungary on the north and Greece on the south, with the Danube and the Save rivers separating it from the dual monarchy. Bulgaria and Rumania adjoined the country on the east, and on the west lay Bosnia, Montenegro and Albania.

Its population in 1914 was nearly 5,000,000 but this number was reduced to 3,500,000 by 1919, according to careful estimates. Of the number who remain, about three-fourths are devitalized from hunger, disease and the strain of war. Large numbers of Serbs are found in the regions adjoining old Serbia, and their union with their kinsmen and the Croats and Slovenes will, it is expected, bring about a building up of the oppressed people of the invaded kingdom. The Serbs are intense lovers of freedom, and have long resented the use of the forms Servs and Servia for Serbs and Serbia. The former terms are not only incorrect, but are distasteful because they are derivatives of the Latin *servus*, or *slave*.

Physical Features. The surface is high and mountainous, the country being traversed by spurs of the Carpathian Mountains in the northeast, the Balkan in the southeast and the Dinaric Alps in the west. None of these is high, and the loftiest summit, Liubotrn, has an altitude of 8,600 feet. The whole country is drained into the Danube, either directly through the Morava, which flows through the center, or indirectly by the rivers that form a part of the boundary. Along the western border are the Drina and the Drin. The climate in the elevated regions is rigorous, but in the valleys and lowlands it is mild and equable. There is plenty of rainfall, and the mountains are covered with forests.

Resources and Industry. Serbia is pre-eminently an agricultural country, and is a land of small farms owned and cultivated by peasants. There are few farms over thirty acres in extent. Wheat, barley, oats, corn, rye and sugar beets are profitable crops, and various fruits, notably plums, are grown. Large quantities of these are dried and exported as prunes, made into marmalade or used in making wine. Silkworms are raised in large numbers, and in the hilly regions ex-

tensive pastures make the raising of live stock an important industry. There are extensive forests of beech, oak and fir, about 1,375,000 acres being under state control.

Flour milling is one of the most important manufacturing industries; before the war there were seventeen large mills in the country. Brewing and distilling, sugar refining, the manufacture of celluloid, carpet weaving, tanning, bootmaking, iron working and the making of pottery are other industries carried on in normal times. The weaving of carpets, a very old industry, is centered in the southeast, in Pirot. The carpets are made of pure wool, colored by local dyers with natural dyes and by a secret process.

Serbia has valuable deposits of coal and lignite and mines of lead, zinc, copper and iron. The mining industry has never been developed to full capacity because of lack of capital and transportation facilities. There was considerable exploitation of the coal deposits by the Germans during the period of occupation.

Transportation and Communication. There are about 975 miles of railroad. A railway between Belgrade and Nish connects with the trunk line which joins Berlin and Vienna with Sofia (Bulgaria) and Constantinople, a factor in Germany's plan for a "Mittel Europa." A railway to Saloniki, Greece, gives Serbia an outlet to the Aegean Sea. The Danube, Drina and Save rivers are navigable.

Government, Religion, Education. Under the constitution of 1903 the executive power is vested in the king, who is assisted by a council of eight Ministers. The people are represented in a legislative assembly called the *Skupshтина*, the members of which are chosen at a general election. There is also a council of state, one-half of whose members are appointed by the *Skupshтина* and the others by the king. The capital is Belgrade, in the northern part of the kingdom, and the Greek Church is the State Church. Elementary education is compulsory, and in all the primary schools under the Ministry of Education it is free, but the rate of illiteracy is high. At Belgrade there is a university founded in 1838, which had over 900 students before the war.

History. In ancient times Serbia formed a part of the Roman province of Moesia. After this it was occupied in succession by Huns, Ostrogoths, Lombards and other tribes. In the seventh century the country was entered

by the Serbians, but in the century following it acknowledged the supremacy of the Byzantine emperors. Later Serbia became independent, and in the middle of the fourteenth century it included all of Macedonia, Albania and Thessaly, the northern part of Greece and Bulgaria. After this its power declined and it became tributary to Turkey, remaining in this condition for about 200 years. In 1718 the greater part of the territory was ceded to Austria, but a few years later was again transferred to Turkey. The oppression of the Turkish government led to several wars, and from 1812 to 1878 the country was ruled by a number of monarchs who were vassals of the sultan. In 1877, during the Russo-Turkish war, Serbia rebelled, and by the Treaty of Berlin in the following year its independence was recognized by the European powers. In 1912 and 1913 Serbia was at war with Turkey and later with Bulgaria, and by the Treaty of Bucharest (1913) it received over 15,000 square miles of territory, comprising four departments. Over 1,700,000 people were added to its population.

In June, 1914, the assassination of the heir to the Austro-Hungarian throne, at Sarajevo, Bosnia, was made the pretext of a declaration of war against Serbia by Austria-Hungary. The latter country claimed that Serbia was the hot bed of Slavic agitation against the integrity of the dual monarchy. Out of this complication was evolved the greater conflict, in which Serbia became a martyred nation. Belgrade was occupied by Austro-German troops on October 9, 1915, and by the close of the year the whole country was under the heel of the oppressor. The sufferings of the people through disease, exhaustion, exile, and persecution from Austrians, Germans and Bulgarians awakened outside sympathy akin to that inspired by the sufferings of the Belgians and Armenians. The aged King Peter and his court removed to Greece for the duration of the war. Late in 1918, Belgrade, then a city stripped of all its valuables, was liberated, but the king remained in retirement, leaving the duties of administration to his son, Prince Alexander, and the Cabinet. Alexander was proclaimed regent of the Jugo-Slavic state in November, 1918.

Related Articles. Consult the following titles for additional information:

Balkan Wars	Jugo-Slavia
Belgrade	Monastir
Berlin, Congress of	Nish
Carpathian Mountains	Peter I
Danube	World War

SERFS, a term applied to a class of laborers existing under the feudal system, whose condition, though not exactly that of slavery, was little removed from it. Under feudalism, from the vassals of the king downward, the whole community was subject to certain degrees of servitude, and it was only on condition of specific services to be rendered to his superior that any individual held his land. In the case of the lower classes this servitude amounted almost to complete surrender of personal liberty. There were two classes of laborers, the villeins and the serfs proper, the former occupying a middle position between the serfs and the freemen. A serf could not be sold, but could be transferred along with the property to which he was attached. A serf could obtain his freedom by purchase, by residing for a year and a day in a borough or by military service. By these various means the serf population gradually decreased, and in most parts of the Continent had disappeared by the fifteenth century. Serfdom in England and Scotland was extinguished very gradually, existing almost in its original form as late as 1574; and even in the eighteenth century a species of serfdom existed among Scottish miners. Serfdom in Russia did not originate in feudalism, but in royal enactment; it was abolished by a manifesto of Alexander II, on March 17, 1861.

SERGEANT, *sahr'jent*, in a military company or in a marine corps, the highest non-commissioned officer, ranking above a corporal. He is below a second-lieutenant, who is the lowest commissioned officer. The top sergeant, or sergeant-major, ranks in authority over all other sergeants in a company.

SERGEANT-AT-ARMS, an officer of a legislative body or of any deliberative assembly. His duty is to execute the orders of its officers and to preserve order. In legislative bodies the mace (which see) is the emblem of his authority.

SERINAGUR, *se re'na gur*, or **SRINAGAR**, INDIA, capital of Kashmir, situated in the Kashmir valley, on both banks of the Jhelam River, 170 miles northeast of Lahore. It is an exceedingly picturesque town when seen from a distance, but the streets are narrow and dirty and contain but little of interest. In the environs are beautiful gardens, and also the lake made famous by Moore in his *Lalla Rookh*. The chief industries are the manufacture of shawls and

rugs, the production of attar of roses and the making of silver articles. Population, 1911, 126,344.

SEROUS MEMBRANES, certain double membranes in the human body, as the pleura, the pericardium and the peritoneum, which form a sort of closed sac surrounding certain organs, the interior surfaces of the sac secreting a small quantity of serous fluid. Serous membranes line cavities not exposed to the air. Their chief function is to allow free action to the organs and prevent the injurious effects of friction. The synovial membranes of the joints belong to this class. These membranes are subject to various diseases. See **PLEURISY**.

SERPENT. See **SNAKE**.

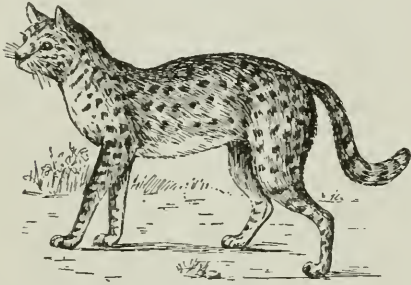
SERPENT CHARMING, a so-called art of great antiquity, confined in practice to Egypt and the East. Although it is a common practice of the charmer to extract the fangs before exhibiting the snakes, this is not always done. The instrument usually employed in serpent charming is a kind of pipe, which is varied by whistling and the use of the voice. The effect of this medley of sounds is to entice the serpents from their holes so they may be pinned to the ground with a forked stick. In India and other Eastern countries the art of serpent charming is an hereditary profession. In addition to the evident power music has upon the serpents, they appear to be influenced in a marked degree by the eye of the charmer, who controls them merely by fixing his gaze upon them.

SERPENTINE, *sur'pen tin*, a rock composed of magnesia, silica and water, ranging in color through varying shades of green to red, yellow or brown. It takes its name from its mottled-green appearance, which was formerly supposed to resemble the skin of some serpents. Much of serpentine is veined or spotted with streaks of white; these varieties are known in the United States as *verde antique* marble. Serpentine takes a high polish and is quite extensively used in finishing for the interiors of public buildings. It is not a good stone for exteriors, because it contains more or less iron, which, on weathering, discolors the stone. It is found in Switzerland, Italy and a number of localities in the United States.

SERUM THERAPY, the treatment of disease by means of blood serum, containing germs which by creating antitoxins in the

blood of the patient render him immune or enable him to resist a disease already acquired. Cultures of the specific germ are made, and some animal, usually a healthy horse, is inoculated. The serum from this animal is tested on a rabbit, for instance, and if found to protect the little animal from inoculation with active disease germs, the serum is felt to be safe for human beings. Vaccination for smallpox is an example of vaccine therapy. Serum therapy has been used with varying success in pneumonia, cholera, typhoid, diphtheria and several other bacterial diseases and promises great results in the fight against disease. See GERM THEORY OF DISEASE.

SERVAL, *sur'val*, a large South American wild cat, about three feet in length. Its general body-color is a bright golden, tinged with



SERVAL

gray and marked with black spots. Its tail is sixteen inches long. The serval, or *tiger cat*, as it is sometimes called, is easily tamed, if captured when young. Its fur commands high prices.

SERVETUS, *serv'e'tus*, MICHAEL, or MIGUEL SERVETE (about 1511-1553), a Spanish physician, scholar and theologian, who was burned at the stake as a heretic. He was born at Tudela, in Navarre. At the age of seventeen he was sent to Toulouse to study civil law, but soon devoted his interests to theology. He incurred the enmity of Roman Catholics and Protestants during the Reformation. After the publication of his *Christianismi Restitutio* (Restoration of Christianity) in Vienna, he was arrested for heresy and imprisoned, but escaped to Naples. He was arrested at Geneva, however, on a charge of blasphemy and heresy, and his various writings were sifted in order to insure his condemnation. The divines of all the Protestant Swiss cantons unanimously declared for his punishment, and Calvin was

especially urgent and emphatic as to the necessity of putting him to death. Servetus is numbered among the anatomists who made the nearest approach to the doctrine of the circulation of the blood before the time of Harvey.

SERVIA. See SERBIA.

SER'VICE, ROBERT WILLIAM (1876-), a Canadian poet and novelist, whose vigorous ballads of the Northwest have gained for him a secure place in Canadian literature. He was born at Preston, England, and educated at Glasgow, Scotland. In 1897 he emigrated to Canada and traveled extensively through the West, encountering experiences which later supplied rich literary material. In 1905 he joined the staff of the Canadian Bank of Commerce and later worked in the bank's branches at White Horse, Yukon Territory, and at Dawson City. His close contact with the vigorous elemental life and wild scenes in the sub-arctic regions enabled him to write about them with accuracy and feeling. The men and conditions he pictures and his literary workmanship give him a place in Canadian literature somewhat like that of Bret Harte's in American literature. His books of verse include *The Spell of the Yukon*, *Songs of a Sourdough*, *Ballads of a Cheechako* and *Rhymes of a Rolling Stone*. He has written two novels, *The Trail of '98* and *The Pretender*. His *Rhymes of a Red Cross Man* were widely read by the allied soldiers in the World War.

SERVIVS TULLIVS, *ser'vi us tul'i us*, the sixth of the seven legendary kings of early Rome. According to tradition he was the son of a slave who was given by the elder Tarquin to his wife. He married Tarquin's daughter, and on the death of his father-in-law (578 B. C.) ascended the throne. He established many civil rights and institutions, greatly improved the condition of the common people, thereby antagonizing the patricians, and extended and beautified Rome.

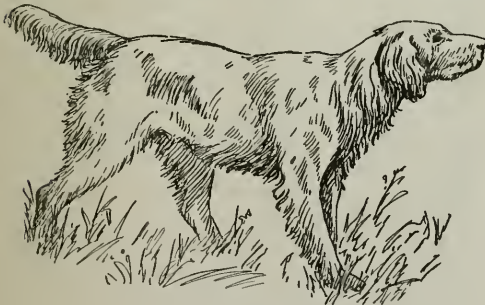
SESAME, *ses'a me*, GRASS. See GAMA GRASS.

SETI I, *sa'te*, an Egyptian king, the second Pharaoh of the nineteenth dynasty (1462 to 1288 B. C.) and father of Rameses II (see RAMESSES II). On the walls of the Hall of Columns at Karnak, which he built, are described his campaigns whereby he established the power of Egypt over a large portion of Western Asia. He built the Temple of Osiris at Abydos.

SETON, ERNEST THOMPSON (1860-), a popular author, artist and lecturer, born in Shields, England. Much of his early life was spent in the Canadian backwoods and on the Western plains. He was educated at the Toronto Collegiate Institute and at the Royal Academy in London, England, and studied six years in Paris. In 1901 he organized the Woodcraft Indians, for boys, a society which later became a nucleus for the Boy Scouts (which see). In 1891 Seton became official naturalist to the government of Manitoba. He was one of the chief illustrators of the Century Dictionary and has illustrated many books on birds and animals.

He is best known as the author and illustrator of stories about animals. These include *Wild Animals I Have Known*; *The Biography of a Grizzly*; *Lobo*; *Rag and Vixen*; *Lives of the Hunted*; *Two Little Savages*; *Monarch, the Big Bear*, and *Animal Heroes*, all dealing with animal life in a way which was original with the author. The truth of Seton's accounts of animals has been questioned by many naturalists, but the stories have certainly aroused a new interest in animals and led to increased study of their habits. Seton has contributed numerous articles and illustrations to magazines and scientific publications and delivered many lectures. He claims to have organized the Boy Scouts, but this distinction is disputed by Daniel Carter Beard.

SETTER, a handsome hunting dog weighing from fifty to sixty pounds and having soft, silky hair, sometimes wavy, and droop-



SETTER

ing ears. Three breeds are recognized. These are the English, which is white, with black markings; the Gordon, rich glossy black, with reddish-brown markings; the Irish, a uniform chestnut color. The dogs are taught to raise a forefoot to indicate game. They are intelligent and easily managed.

SEVEN PINES. See FAIR OAKS, BATTLE OF.

SEVEN SLEEPERS, according to a sixth-century story, were seven Christian youths of Ephesus, who, by a command of the Emperor Decius, were imprisoned in a cave in Mount Celion, in which they had taken refuge. Here they fell into a deep slumber, from which they were awakened by a shepherd after a lapse of about two hundred years. On emerging from the cave, during the reign of Theodosius II, they were surprised at changed conditions everywhere, as was the populace over their strange visitors. The youths related their story to the multitude, gave it their blessing, and died. The Mohammedans have a similar legend.

SEVENTEEN-YEAR LOCUST. See CICADA.

SEVENTH DAY ADVENTISTS, the largest sect of the Adventists, numbering about 83,000 members in America and supporting more than 2,000 churches. According to their doctrine, the seventh day of the week, the Christian Saturday, is the Sabbath. They believe that the dead sleep till the day of judgment; that the unsaved are destroyed; that the care of bodily health, total abstinence and the eating of vegetable food are religious duties. They have established sanitariums in various states, and their missionary work extends into almost every country in the world. In the United States their headquarters are at Takoma Park, a suburb of Washington, D. C.; previous to 1903 the headquarters were at Battle Creek, Mich. Their publications are numerous and embrace discussions of the Bible and of their own peculiar doctrines, histories of their sect, and treatises on health and disease.

SEVEN WEEKS' WAR, a struggle, in 1866, between Prussia and Italy on one side and Austria and its allies on the other, which determined that Prussian influence was to be predominant in Germany. The issue was forced by Bismarck, who used the Schleswig-Holstein controversy as a pretext. The Prussians under Von Moltke were from the first victorious, and after the Battle of Königgrätz, or Sadowa, Austria was obliged to sue for peace, which was concluded in the Treaty of Prague.

Related Articles. Consult the following titles for additional information:

Austria-Hungary
Bismarck-Schön-
hausen

Moltke, Count von
Sadowa, Battle of
Schleswig-Holstein

SEVEN WISE MEN OF GREECE, men who are largely shrouded in obscurity who lived in the sixth and seventh centuries before Christ. The generally-accepted list of these sages and philosophers includes Periander, Pittacus, Thales, Solon, Bias, Chilon and Cleobulus. Maxims of prudence and elementary morality are regarded as embodying a summary of their wisdom. Among these maxims are "Know thyself," "Nothing in excess," "Consider the end," "Forethought in all things."

SEVEN WONDERS OF THE ANCIENT WORLD, a group of seven most notable works of art of antiquity, celebrated for their beauty and colossal size. The earliest list of these was compiled from numerous guide books of the Greeks, and varies but little from the later and more authentic list found in the work of Philo of Byzantium. This latter includes the Pyramids of Egypt; the Hanging Gardens of Semiramis, at Babylon; the statue of Zeus, or Jupiter, by Phidias, at Olympia; the Temple of Artemis, or Diana, at Ephesus; the Mausoleum at Halicarnassus; the Colossus of Rhodes; and the Pharos, or Lighthouse, at Alexandria.

Seven Modern Wonders. Science takes precedence over art in the list of seven wonders of the modern world, which is devoted to its great inventions and discoveries. Leading scientists include the following seven as the most marvelous scientific discoveries of modern times: the wireless telegraph, invented by Marconi; the telephone, invented by Reis of Germany and Gray and Bell of the United States; the aeroplane, invented by the Wright brothers, of Ohio; the discovery of antiseptics, by Sir Joseph Lister; radium, discovered by Pierre and Marie Curie; the X-ray discovered by Roentgen; and spectrum analysis, discovered by Sir Isaac Newton.

Related Articles. The following articles give specific information about the ancient and modern wonders:

Antiseptic	Pyramids
Colossus	Radium
Flying Machine	Roentgen Rays
Hanging Gardens	Spectrum Analysis
of Babylon	Telegraph, Wireless
Mausoleum	Telephone
Pharos	

SEVEN YEARS' WAR, a famous war between Prussia and other European powers, which lasted from 1756 to 1763. As the result of a war with Prussia, Maria Theresa of Austria had been forced to cede Silesia to Frederick the Great. To recover her lost

territory she concluded an alliance with Russia, secured the support of Poland and Saxony and attempted to form a closer union with France. In the meantime war broke out between France and England (1755), and George II, in order to protect his German states, concluded an alliance with Prussia, a move which decided France to aid Austria. Being informed of these negotiations, Frederick resolved to anticipate his enemies. In August, 1756, he invaded Saxony, occupied the chief towns and compelled the Saxon army to surrender. This step created a stir in the European courts, and in 1757 Austria, Russia, France, Sweden and the German Empire were in arms against Frederick, while he had no allies but England and a few German states. In 1757 Frederick marched into Bohemia and gained a bloody battle at Prague. Soon after this, however, the Austrians, under Daun, defeated Frederick at Kolin, relieved Prague and forced the Prussians to retreat to Saxony. The French army, after defeating Frederick's allies under the Duke of Cumberland, united with the imperial forces. Frederick met them at Rossbach and routed both armies, then hurried back to Silesia, which was occupied by the Austrians, and vanquished a superior army under Daun at Leuthen, thus recovering Silesia. While Frederick was thus occupied in the south and west, his general, Lehwald, had successfully repelled the Swedes and Russians on the north and east.

The next campaign was opened in February, 1758, by Ferdinand, Duke of Brunswick, who, at the head of Frederick's allies, opposed the French in Lower Saxony and Westphalia. He defeated the French at Crefeld in June and ultimately drove the enemy beyond the Rhine. Frederick defeated the Russians at Zorndorf and was defeated in turn by Daun at Hochkireh, but before the end of the year he drove the Austrians from Silesia and Saxony.

In 1759 Frederick suffered at Kunersdorf a defeat such as he had never sustained before, and his position became extremely precarious. The British victories over the French helped matters somewhat, and the campaign of 1760 opened well for him. George II of England died in this year, however; Pitt was removed from power and Prussia thus lost its only ally. It seemed as if nothing could save it, but in 1762, when Frederick's fortunes were at their worst,

Elizabeth of Russia died and was succeeded by Peter III, who was an enthusiastic admirer of Frederick. Russia made a treaty with Prussia, but Peter was deposed before Russia could lend Frederick any substantial aid. However, Russia did not again join Austria, and as both sides were practically exhausted, peace was concluded at Hubertsburg in 1763. Matters were adjusted as they had been before the war, and Frederick was allowed to retain Silesia. The struggle between France and England in Europe was accompanied in America by the conflict known as the last French and Indian War (See FRENCH AND INDIAN WARS).

SEVERN, *sev'ern*, the second largest river in England. It rises in Wales, and after a circuitous easterly and southerly course of about 210 miles, through England, it empties into the British Channel through an estuary under which runs a tunnel about four miles long. It is navigable a distance of 180 miles. Below Gloucester the banks are so low that destructive inundations have frequently occurred. Worcester and Shrewsbury are two other important cities on the Severn.

SEVERUS, *se'verus*, LUCIUS SEPTIMIUS (146-211), a Roman emperor. After the murder of Pertinax in 193 he was proclaimed emperor by his troops, and is therefore included among the "Barracks Emperors." Severus marched to Rome to subdue the partisans of Julianus, who had obtained the throne from the praetorians by bribery. On his approach, Julianus was assassinated by his own soldiers. Severus banished the praetorians and ridded himself of the rivalry of Albinus, commander of the Roman forces in Britain. He then marched to the East against Pescennius Niger, who had also been elected emperor by a powerful army. After many obstinate battles, Niger was routed on the plains of Issus. Having sacked Byzantium and conquered several Eastern peoples, Severus returned to Rome. After a successful campaign against the Parthians, he next subdued an insurrection in Britain. To protect the people of the south from incursions of the Highlanders, he built a stone wall from the Tyne to the Solway Firth. See ROMAN WALLS.

SEVILLE, *se vil'*, SPAIN, is situated on the Guadalquivir River, sixty-two miles north northeast of Cadiz. It is built in Moorish style, has narrow streets, lined with old Moorish houses, which are usually built around

interior courtyards with fountains in the center. Many of the dwellings are of two stories, and nearly all of them are white. The city is notable for its abundant and beautiful vegetation. It was formerly enclosed by a wall, but only a few remains of this are now visible. The principal parks or squares are the Plaza de San Fernando and the Plaza de Triomfo, upon which is the cathedral. The city also has a number of boulevards, noted for their beauty. Among the buildings of note are the Cathedral of Seville, which ranks next to Saint Peter's at Rome in size; the Giralda, the Campanile, in the form of a square tower over 300 feet in height and dating from the sixteenth century; the palace of the Moorish kings, or the Alcazar, and the chapel of the Catholic kings.

The chief educational institutions include the University of Seville, the provincial school of art, the provincial museum and the provincial library, which has over 80,000 volumes, and the Columbian Library, founded by the son of Columbus. The civil hospital is noted as one of the largest institutions of the kind in the world. The leading industries include the manufacture of tobacco, silk, ironware, soap and chocolate. The city has an important trade with the surrounding country. It is one of the oldest cities of Spain and was a place of considerable importance under the Romans. Next to Madrid it is the most important center of literature, art and education in Spain. During the eleventh century it was the capital of a Moorish state. Later it was captured by Saint Ferdinand of Castile, and was for a long time the capital of the Castilian dominion. At the time of the discovery of America, it was the leading commercial port of Spain. Population, 1918, 164,322.

SEVRES, *sa'vr'*, **PORCELAIN**, an artistic pottery having the general effect of a cameo, though possessing greater delicacy and richness of color. In its construction the *pate-sur-pate* (or layers) method is used, original with this ware. Sevres porcelain has been highly prized since the first days of its manufacture at Vincennes, in 1745. In 1756 the manufactory was purchased by Louis XV, removed to Sevres, and placed under state supervision; from the fact of its location here the name was derived. Many noted artists were employed to decorate the plaques, vases and ornaments which are still the pride of collectors. In recent years, how-

ever, very clever imitations have been made in Germany and England, and these have flooded the markets.

SEWAGE AND SEWERAGE. Sewerage is the system of pipes and conduits for conveying away from houses and factories the waste matter known as *sewage*, and depositing it at safe distances from cities and towns. Sewage is made up of solid and liquid matter from houses, the fluid waste from domestic and manufacturing operations, generally much of the surface drainage and sufficient water to carry away the waste. In small villages and in farming communities, each house disposes of its own sewage, usually in the soil, and this under ordinary circumstances is a safe method; but wherever people are crowded together it is necessary to dispose of all refuse matter promptly and completely (see GARBAGE). The customary way, especially in the smaller cities, is to float the sewage off in airtight tubes, to such a distance that it will be harmless. Except in very level countries, the force of gravity is sufficient to carry away the sewage, but in some places pumping stations are necessary to distribute it properly. It is evident that plenty of water is necessary to carry away the refuse successfully, and in many places drains are so arranged that surface water is conducted to the sewers, where it assists in carrying off the solid matter. Such a plan, however, is open to objections, since at times the sewer pipes are partially empty and poisonous gases collect and escape through the drainage openings. A better plan is to keep the drainage system separate from the sewers.

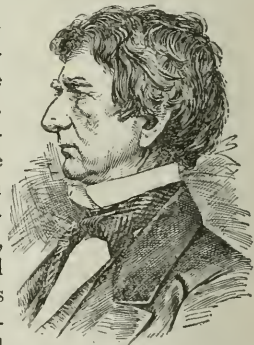
Small sewers are usually made of terra cotta or vitrified clay, but when they are more than two feet in diameter, iron pipes are used or brick sewers are constructed. In large cities the more expensive stone masonry and concrete are substituted for brick. The sewers should be properly ventilated, so that noxious gases may not rise through the pipes to the houses and cause sickness. To prevent the escape of sewer gas into dwellings and factories all drain pipes have a u-shaped bend called a *trap*, in which water constantly stands. Yet the danger from gas is not so great as the danger from polluting the soil or water supply of the town with the sewage. If the waste matter can be carried far out into some large body of water, it may be deposited with safety, because the water in

time disinfects the refuse; but where the sewage is thrown into small streams or small bodies of water, the possibilities for conveying disease to other places, if not to the one whence the sewage originated, can scarcely be overestimated.

The sewerage systems of great cities such as London, Paris, New York and Chicago involve some of the most difficult engineering problems found in any class of construction. Some of the mains in these systems are from sixteen to twenty feet in diameter. In order to dispose of the sewage Chicago excavated a drainage canal at an expense of \$50,000,000.

Sewerage on Farms. On many farms waste can be disposed of in the soil without danger, but on others there is great danger of water pollution. Most farm houses can be supplied with running water at a moderate expense; wherever this convenience is at hand, sewage can be conveyed to a safe distance, where it may be absorbed by the soil; but when this is not practicable, a settling tank in which the sewage is cleansed of impurities may be installed.

SEWARD, *su'ard*, WILLIAM HENRY (1801-1872), an American statesman, Secretary of State in Lincoln's Cabinet and purchaser of Alaska for the United States. He was born in Florida, Orange County, N. Y., and was educated at Union College. After practicing law for a number of years, he drifted into politics. In 1830 he was elected a member of the New York senate, in 1838 became governor of his state, and in 1849 entered the United States Senate. There he became the friend and adviser of President Taylor and distinguished himself by his firm resistance to the extension of slavery, opposing in eloquent speeches the Compromise of 1850 and the Kansas-Nebraska Bill.



WILLIAM HENRY
SEWARD

In 1860 he was a candidate for the Presidential nomination, but having been defeated in the convention by Abraham Lincoln, he exerted himself to secure Lincoln's election and was later appointed Secretary of State. In this post he discharged his duties with

great ability. He adjusted the Trent affair (see TRENT AFFAIR) and the Alabama Claims (see ALABAMA, THE), secured the withdrawal of the French from Mexico, and purchased Alaska from Russia. He was dangerously wounded in April, 1865, when Lincoln was assassinated, by an accomplice of Booth. He served as Secretary of State under President Johnson, and continued in public life until the inauguration of President Grant.

SEWING MACHINE, a device which has done away with much household drudging throughout the civilized world, and made the modern clothing industry possible, was patented by Elias Howe of Boston, in 1846.

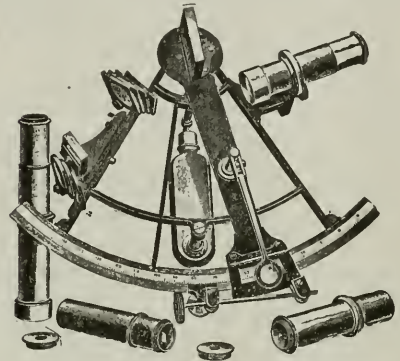
Howe's machine consisted of a needle, with an eye near the point, and below the cloth, a shuttle, which carried another thread on a small spool, called the *bobbin*. The needle was attached to an arm vibrating on a pivot so as to force the needle through the cloth. The shuttle carried the lower thread through the loop made by the upper thread and locked it as the needle tightened the loop with its upward movement. While numerous patterns of machines have been invented since, all double-threaded machines are constructed on the principle invented by Howe. The Singer machine, which soon followed the Howe, had an improved plan for operating the needle and for moving the cloth along as it was sewed. This machine also used the treadle as motive power. Previous to the invention of the Singer, all sewing machines were operated by turning a crank by hand.

Single-threaded machines make what is called a chain stitch. Of these the Wilcox and Gibbs is the most successful pattern. While these machines are easily operated, they have the defect that if one stitch becomes broken the entire seam is likely to be raveled. There are now sewing machines constructed for nearly every line of work done by the needle, such as sewing on buttons, making button-holes and sewing boots and shoes, harness and carpets.

We consider Howe the inventor of the sewing machine, because he was the first to get a practical machine on the market, but others had made the attempt at an earlier date. The first known attempt was that of Thomas Saint, an Englishman, in 1790, but his machine was not practical. In 1830 a machine was made in France which was successfully used in making clothes for the army, but it was destroyed by a mob, because the tailors

thought that its use would take away their employment. Two years later Walter Hunt of New York made a number of machines on a plan similar to that found in the successful machines of the present day, but he failed to take out a patent.

SEXTANT, an instrument used for measuring angles between any two points, such as the sun and the horizon, employed most commonly by sailors in determining the posi-



SEXTANT

tion of a ship at sea or in marine surveying. It consists of a frame of metal and ebony, stiffened by cross-braces and having an arc embracing 60° of a circle. It has two mirrors, one of which is fixed to a movable index, and various other appendages.

The principle of the sextant, and of reflecting instruments in general, depends upon an elementary theorem in optics; namely, if an object be seen by repeated reflection from two mirrors which are perpendicular to the same plane, the angular distance of the object from its image is double the inclination of the mirrors.

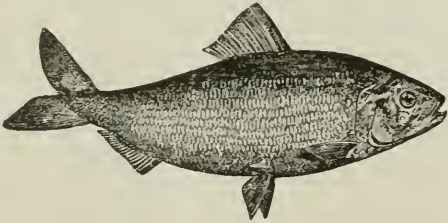
In reading the graduated arc, half-degrees are taken as degrees, because that which is measured on the index is the angle between the mirrors, and this is half the distance between the objects. If one is familiar with the position of the star in the celestial sphere, the latitude of the ship can be found by comparing its altitude, as shown in the sextant, with this position.

SHACKLETON, *shak' u ton*, ERNEST HENRY, Sir (1874-), an English explorer of the Antarctic regions, born at Kilkee, Ireland, and educated at Dulwich College, London. He served as lieutenant in the British navy and was second in command to Captain Scott in the British Antarctic expedition of

1901. In 1906 he was defeated in an attempt to enter Parliament as a representative of Dundee. The following years he spent in command of an expedition in the Antarctic regions. In 1909 he reached latitude $80^{\circ} 23'$, a point 111 miles from the pole. Lack of supplies compelled him to turn back. This expedition, however, was of considerable importance, as it resulted in a gain of accurate knowledge of the south polar region. On his return to England Shackleton was knighted. His published account of his expedition is entitled *The Heart of the Antarctic*.

In 1914 Shackleton sailed on another expedition which was destined to be the most thrilling in the annals of polar exploration. His ship, the *Endurance*, was crushed in an ice pack; the party was forced to abandon it, and after unspeakable hardships on floating islands of ice and on the seas in open boats, the men finally were rescued and reached England in 1917. Shackleton has lectured in Great Britain, Canada and the United States, and has received many medals and other honors. See SOUTH POLAR EXPLORATION.

SHAD, a food fish of the family of herrings, including two species—the *common*, or *allice*, shad, and the *white* shad. The common shad inhabits the sea near mouths of



SHAD

large rivers, and in the spring ascends them for the purpose of depositing its spawn. The form of the shad is the same as that of other herrings, but it is of larger size, and in some places receives the name of *herring king*. Its color is a dark blue above, with brown and greenish lusters, the under parts being white. An American species, varying in weight from four to twelve pounds, is highly esteemed for food and is consumed in great quantities in the fresh state. Shad are found along the coast from New England to the Gulf of Mexico, and have been successfully introduced on the Pacific coast. In recent years the annual catch in the United States has equaled about 25,000,000 pounds.

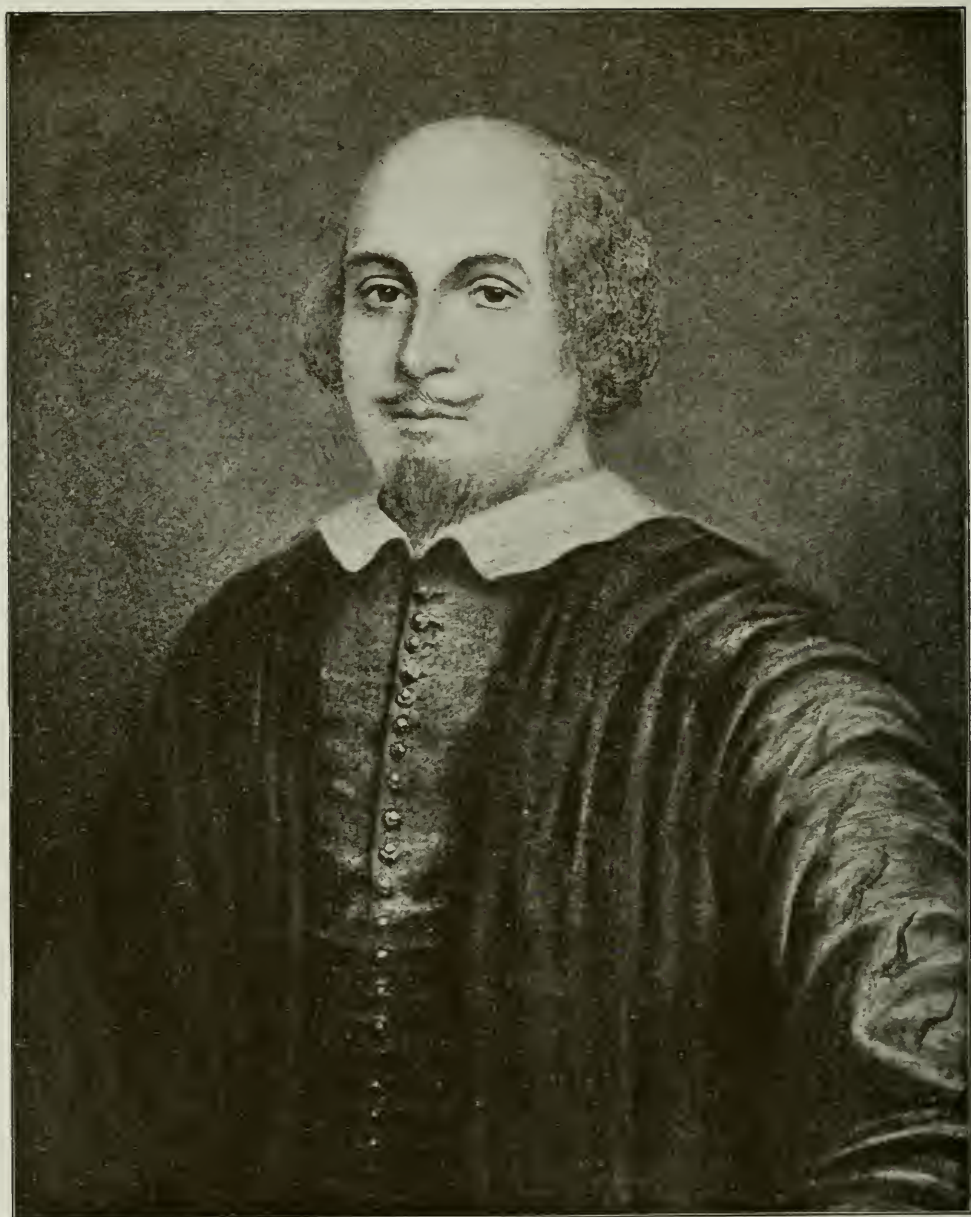
SHAD FLY. See MAY FLY.

SHADOW. See LIGHT.

SHAF'TER, WILLIAM RUFUS (1835–1906), an American soldier who distinguished himself as commander of land operations in Cuba during the Spanish-American war in 1898. He was born at Galesburg, Mich., and was reared on a farm. At the outbreak of the Civil War he entered the Union army, and before its close was brevetted brigadier-general for gallantry in action. After that war he entered the regular army serving in various posts until the outbreak of the Spanish-American War. In that brief conflict he commanded operations which resulted in the surrender of the Spanish army at Santiago. Later he commanded various departments, and retired, in 1901, with the rank of major-general.

SHAFTESBURY, *shafts' bur ri*, ANTHONY ASHLEY COOPER, First Earl of (1621–1683), an English statesman and philanthropist. He was a member of the parliaments of 1640, and at the time of the Civil War joined the Parliamentary cause, after having shown slight royalist leanings. He had a prominent position under Cromwell during the Protectorate, but after Cromwell's death he saw that a restoration of the legitimate monarchy was what the country really wished and used his influence to that end. Charles II created him first Baron Ashley, and later made him Earl of Shaftesbury. He served as Chancellor of the Exchequer and as a member of the hated Cabal. In 1679 he became president of the council, and in the same year succeeded in passing the Habeas Corpus Act. Shaftesbury was largely responsible for the revision of the lunacy laws and administration, and did much to improve the condition of factory workers. Because of his connection with treasonable plots, he was compelled to flee to Holland, where he died. He is the Achitophel of Dryden's *Absalom and Achitophel*.

SHAGREEN', a kind of untanned leather, with a rough surface, prepared from skins of horses, oxen, asses and camels. The hides are soaked and laid on a flat surface, and small, hard seeds are sprinkled over them. A board is then pressed on them to force the seeds into the skins. After the skins are dry the seeds are shaken out and the rough surface is trimmed and pared. The skin is soaked a second time, and the depressed parts rise, producing the surface roughness. The



WILLIAM SHAKESPEARE

From the portrait, Stratford upon Avon, England

leather is then dyed. The skins of shark, sea otter, seal and other animals have also been used for making this leather. Shagreen was formerly employed for covering sword scabbards; it is now used to a limited extent as a covering for camera boxes, instrument cases and various like articles.

SHAH JEHAN, *shah je hahn'* (about 1592-1665), the fifth Mogul emperor of Delhi, India, who reigned from 1627 to 1658, when he was deposed by his son Aurungzebe. During his reign the Mogul Empire attained great magnificence. He founded Delhi, where he erected a group of splendid buildings which constituted the imperial palace, one of which housed the celebrated peacock throne. He built the Pearl Mosque and the Taj Mahal, at Agra, as a mausoleum to his favorite wife. See TAJ MAHAL.

SHAKERS or **SHAKING QUAKERS**, a sect which arose at Manchester, England, about 1747, and which has since been transferred to America. The formal designation which they give themselves is the United Society of Believers in Christ's Second Appearing, that of Shakers was given to them in ridicule because they shook their bodies during their religious services.

The founder of the sect as it at present exists was Ann Lee, an expelled Quaker, born in Manchester in 1756. She came to America in 1774 with seven followers and formed the first settlement at Watervliet, near Albany, N. Y. In 1787 the society was made communistic, the first organization on that basis in the United States. There are now (1919) seventeen communities in America, mainly in the New England states.

Shakers beliefs are similar in many respects to those of the Quakers. They believe in the immediate revelations of the Holy Ghost (gifts); maintain that the old law is abolished, the new dispensation begun; that intercourse between heaven and earth is restored; that God is king and governor; that the sin of Adam is atoned and that man is made free from all errors except his own; that every human being will be saved; that the earth is heaven, now soiled and stained, but ready to be brightened by love and labor into its original state.

At first the religious ceremonies were of the most violent, wild and irregular nature—leaping, shouting and clapping of the hands; now the Shakers move in a regular, uniform dance, to the singing of a hymn, and march

around the hall of worship, clapping their hands in regular time. The societies are divided into smaller communities, called families, each of which has its own male and female head. Celibacy is enjoined upon all, and married persons on entering the community must live together as brother and sister. All property is held in common, and all bind themselves to take part in the family business—the men either as farmers, builders, gardeners, smiths, painters, or as followers of some other handicraft; the women engage in some household occupation or in the work of education, and never interest themselves in political affairs.



Memorial Theatre
at Stratford

SHAKESPEARE, *shayk' speer*, WILLIAM (1564-1616), an English poet and dramatist, the greatest of English poets, one of the greatest of the world's poets.

Ancestry and Boyhood.

He was born at Stratford-upon-Avon, a town in Warwickshire. His father was John Shakespeare, a burgess of Stratford, who combined his business as a butcher, a wool-stapler and a glover, with dealings in timber and corn. His mother was Mary Arden, daughter of Robert Arden of Wilmecote, a prosperous yeoman farmer. They had eight children (four sons and four daughters), of whom William was the third. When the third child was born, and for some time afterward, the family was prosperous, for in 1568 John Shakespeare was high bailiff of Stratford. From this fact it may safely be inferred that his son received the best education which the grammar school of Stratford could give. After the school period the first absolutely authentic event in Shakespeare's life is his marriage with Anne Hathaway, daughter of a yeoman in the hamlet of Shottery, near Stratford. The marriage bond is dated November 28, 1582, at which date Shakespeare was in his nineteenth year, while, from the date on her tombstone, it is known that his wife was eight years older. On May 26 following, their first child, named Susanna, was baptized, and in February of 1585, a son and daughter were born, who received the names of Hamnet and Judith.

Begins His Literary Career. From this date until Shakespeare was established in London as a player and dramatist, there is a gap of seven years, during which we are again left to tradition and conjecture. To account for his leaving Stratford it has been suggested that his marriage with Anne Hathaway had proved unsuitable and unhappy, but there is no positive evidence in support of this belief. Then, again, there is the famous legend of the deer stealing, for which it is said he was prosecuted by Sir Thomas Lucy, of Charlecote. In retaliation he wrote, according to Rowe, a satirical ballad, which so enraged the baronet that Shakespeare thought it prudent to leave Stratford. The more probable reason is that his increasing domestic responsibilities, together with the acquaintance he presumably had with the players from London who visited Stratford, induced him to push his fortune in the city. He soon became a well-known player and a dramatist of such distinction as to call forth an envious reference in 1592 from a fellow dramatist. This is found in *A Groatworth of Wit*, written by Robert Greene, and published a few weeks after his death by Chettle.

Growing Fame and Prosperity. The first certain date in Shakespeare's life after his arrival in London is 1593. In that year he published his *Venus and Adonis*, with a dedication of this, "the first heir of my invention," to Henry Wriothesly, Earl of Southampton; and in the following year he dedicated to the same patron his other poem of *The Rape of Lucrece*. As suggesting that this patronage was substantial in its nature, there is a story to the effect that the earl at one time gave to Shakespeare £1,000 (\$5,000) to complete some purchase he had on hand. Whatever truth there may be in the story, it is certain that about this time Shakespeare began to grow in fortune and in fame. In connection with this increase of fortune it is noteworthy that the affairs of his father, John Shakespeare, seem also to have improved, for in 1596 he applied at the herald office for a grant of arms, which application was conceded in the following year. In 1596 Shakespeare's only son Hamnet died and was buried at Stratford, where the family continued to reside. The tradition is that Shakespeare visited his native town once a year during the time that he lived in London. However this may be, it is clear that

his interest in Stratford was not founded entirely in sentiment or family affection, for in 1597 he bought there a substantial house, called New Place, and in a return of grain and malt he is described as the holder of ten quarters. There is also documentary evidence to prove that he was possessed of property in the parish of Saint Helen's, Bishopgate.

While these things indicate the growth of his material prosperity, there is proof that his fame as a lyrical poet and dramatist was also being securely established, for in 1598 there was published the *Palladis Tamia*, by Francis Meres, in which twelve of his plays are enumerated, and in which mention is made of his "sugared sonnets among his private friends." Yet, notwithstanding this literary activity, he was still a player, for when Jonson's comedy of *Every Man in His Humor* was produced in 1598, Shakespeare took part in the performance. In the following year he was a shareholder in the Globe Theater, and his practical turn is still further evidenced by the fact that he bought (1602) 107 acres of arable land in the parish of Old Stratford for £320 and acquired (1605) for £440 the unexpired term of a lease of the tithes of Stratford, Old Stratford, Bishopton and Welcombe. Along with these material possessions he received the style and title of William Shakespeare, Gentleman, of Stratford-upon-Avon; but in London he was still a player in 1603, since when Ben Jonson's play of *Sejanus* was produced in that year, Shakespeare occupied a place in the list of actors. His father had died in 1601; his eldest daughter Susanna had married, in 1607, a practicing physician named John Hall; in the same year his brother Edmund, who was also a player, died in London and was buried in Southwark, and in 1608 his mother, Mary Shakespeare, followed her husband to the grave. In February, 1616, his youngest daughter, Judith, married.

Death and Burial. On the twenty-fifth of March, 1616, Shakespeare executed his will; and in another month he was dead. The cause of his death is unknown, but in Stratford there was a tradition "that Shakespeare, Drayton and Ben Jonson had a merry meeting and, it seems, drank too hard, for Shakespeare died of a fever there contracted." By his will he left the bulk of his property to Susanna Hall and her husband, his daughter Judith, his sister Joan and his godson, while

Outline on Shakespeare

BIRTH.

1. Born at Stratford-on-Avon, 1564.

PARENTS.

1. Of humble origin; respectable tradespeople; financially well-to-do.
2. His mother was Mary Arden.

EDUCATION.

1. Best education grammar school offered.
2. Studied humanity and nature.

MARRIAGE.

1. Nineteen years of age.

EARLY CAREER.

1. In 1592 established in London, engaged in literary work, and also took some of the leading parts in plays.

CHARACTER.

1. Ben Jonson said: "I loved the man and do honor to his memory, on this side idolatry, as much as any. He was indeed honest and of an open nature; had an excellent phantasy, brave notions and gentle expressions."

WRITINGS.

1st Period.

- a. Experimenting in characterization; looseness in construction. Feeling after his powers and testing them.
- b. Writings—Love's Labor Lost, The Comedy of Errors, A Midsummer Night's Dream, Richard III.

2d Period.

- a. With increased assurance follow his brilliant portrayal of English history and comedy of life in general, and one great romantic tragedy, King Richard II.
- b. Writings—Parts I and II of Henry IV, King John, Romeo and Juliet, The Merchant of Venice, Much Ado About Nothing, As You Like It, etc, etc.

3d Period.

- a. Master of all the resources of his art.
- b. Personal experiences portrayed in writings. Comedy becomes bitter; tragedies black with human experiences.
- c. Writings—Measure for Measure, Julius Cæsar, Hamlet, King Lear, etc., etc.

4th Period.

- a. Attained serenity of mind, enabling him to write his last romantic plays.
- b. Writings—Cymbeline, The Winter's Tale, The Tempest, King Henry VIII.

DEATH.

1. Died in 1616.
2. Buried in Stratford church; a monument with bust and epitaph was soon afterward set up.

NONDRAMATIC WRITINGS.

1. Venus and Andonis, The Rape of Lucrece, Sonnets, A Lover's Complaint.

a few friends and fellow players were also remembered. To his wife he bequeathed specifically the "second best bed with the furniture," for there would probably be ample provision made for her, as a widow had right of dower in her husband's freehold property. He was buried in the chancel of Stratford church, on the north wall of which a monument, with bust and epitaph, was soon afterward set up. Over his grave was placed a slab with the inscription:

Good frend, for Jesus sake forbear
To digg the dust enclosed heare;
Bleste be the man that spares thes stones
And curst be he that moves my bones.

Tradition says that these words were written by Shakespeare himself shortly before his death, but of this there is no proof. As for Shakespeare's character, as estimated by his contemporaries, it found fit expression in the words of Ben Jonson. "I loved the man," he said, "and do honor to his memory, on this side idolatry, as much as any. He was indeed honest, and of an open and free nature, had an excellent phantasy, brave notions and gentle expressions."

The Plays. In classifying the plays of Shakespeare by the aid of such chronology as is possible, modern critics have found it instructive to divide his career as a dramatist into four marked stages. The *first period* (1588-1593) marks the inexperience of the dramatist and gives evidence of experiment in characterization, looseness in the construction of plot, with a certain symmetrical artificiality in the dialogue. To this stage belong *Titus Andronicus* and Part I of *Henry VI*, both of which, it is thought, Shakespeare merely retouched; *Love's Labour Lost*; *The Comedy of Errors*; *The Two Gentlemen of Verona*; *A Midsummer Night's Dream*; parts II and III of *Henry VI* in which it is thought probable that Marlowe had a hand, and *King Richard III*. The *second period* (1594-1601) is that in which, with increased security in his art, the dramatist sets forth his brilliant pageant of English history, his brightest conception of the comedy of life and more than proves his capacity for deeper things by one great romantic tragedy. To this stage belong *King Richard II*, parts I and II of *Henry IV*, *King Henry V*, *King John*, *Romeo and Juliet*, *The Merchant of Venice*, *The Taming of the Shrew*, *Merry Wives of Windsor*, *Much Ado About Nothing*, *As You Like It* and *Twelfth Night*.

The *third period* (1602-1608) shows that the dramatist, having mastered all the resources of his art and tasted life to the full, is strangely fascinated by mortal mischance, so that even his comedy becomes bitter, while his tragedy is black with the darkest tempests of passionate human experience. To this stage in his development belong *All's Well That Ends Well*, *Measure for Measure*, *Troilus and Cressida*, *Julius Caesar*, *Hamlet*, *Othello*, *King Lear*, *Macbeth*, *Anthony and Cleopatra*, *Coriolanus* and *Timon of Athens*. The *fourth period* (1609-1613) is that in which Shakespeare, after having passed through a season which was probably darkened by his own personal experiences, attained the glad serenity of mind which enabled him to write his last romantic plays. To this period belong *Pericles*, which is only partly from Shakespeare's hand, *Cymbeline*, *The Winter's Tale*, *The Tempest* and *King Henry VIII*.

Other Writings. Of non-dramatic pieces Shakespeare was the author of *Venus and Adonis*, *The Rape of Lucrece*, the *Sonnets* and *A Lover's Complaint*. It is agreed that only a few of the poems in the collection published under the name of *The Passionate Pilgrim* were written by him. There has been much discussion as to how many of the plays usually credited to Shakespeare were really written by him, and systematic attempts have been made to prove that Bacon, not Shakespeare, was the author of the greater part of them. Such a theory is generally regarded as without foundation. See halftone, STRATFORD-UPON-AVON.

SHALE, the solidified mud of past geological ages. It has a slaty structure and usually contains a large proportion of clay. Shale is frequently found deposited between seams of coal and commonly bears fossil impressions. The variety known as bituminous shale burns with flame and yields an oil, which, mixed with paraffin, is of great commercial importance. Alum is manufactured from alum shales.

SHALER, NATHANIEL SOUTHGATE (1841-1906), an American geologist, educator and author, born in Newport, Ky. He was graduated from the Lawrence Scientific School of Harvard University, served for a time in the Federal army during the Civil War, and later became dean of the Lawrence Scientific School. For seven years he had charge of the geological survey of Kentucky, and in 1884



STRATFORD-UPON-AVON AND SHAKESPEARE'S BIRTHPLACE

joined the staff of the United States Geological Survey of the Atlantic Coast Division. He was the author of many books, notably *The United States of America; A Study of the American Commonwealth; Aspects of the Earth, Sea, and Land; First Book in Zoölogy; Man and the Earth*, and *Outlines of the Earth's History*.

SHAMANISM, *shah'man iz'm*, a general name applied to the idolatrous religions of a number of barbarous nations in Northern Europe and Asia. The *shaman* is a priest who performs sacrifices and works magical spells to keep the populace on good terms with the gods. In addition to belief in a supreme being, the worshipers add the belief that the government of the world is in the hands of a number of secondary gods, whom it is necessary to propitiate by magic rites and spells. The "medicine man" of North American Indian, with his wicanny rites, exerted a similar influence.

SHAMO'KIN, P.A., in Northumberland County, forty miles nearly north of Harrisburg, on the Philadelphia & Reading and the Pennsylvania railroads. It is in the anthracite coal fields and also contains foundries, machine shops, silk and knitting, flour and planing mills, skirt and hose factories and wagon shops. There is a Carnegie Library. The town was laid out in 1835, and the borough was incorporated in 1864. Population, 1910, 19,588; in 1917, 21,274 (Federal estimate).

SHAMROCK, the national emblem of Ireland, said to have been used by Saint Patrick to exemplify the doctrine of the Trinity, its three divisions illustrating his idea that the Father, the Son, and the Holy Spirit can be three and yet be one God.

The shamrock has a leaf which has three leaflets. It is generally supposed to be the plant called white clover, but others think it to be the white sorrel. The plant commonly called the shamrock in Ireland is one of the hop clovers, a slender, trailing species, with small, yellow heads.

SHANGHAI, *shahng hi'*, CHINA, the most important commercial center of the country, situated 160 miles east-southeast of Nanking, on the left bank of Hwang-pu, by which it is joined to the Yang-tse-kiang. The Chinese part of the city is enclosed within a wall about twenty-four feet high. In this part the streets are narrow and dirty and the buildings are low and crowded together; but north and

northeast of the Chinese quarter is a large foreign settlement, occupied by British, French, Germans and Americans. Along the water front this part of the city presents the appearance of a modern European or American town. It has theaters, newspaper offices, club houses, street railways and electric light plants. A fine esplanade skirts the river and a park lies on the opposite side. This portion of the city also contains a fine cathedral, municipal offices and hospitals. The governing authorities of the foreign settlement are chosen from Americans, English and French who reside there, and the residents are under the protection of the consuls of their respective governments.

Shanghai is the eastern terminal of the Hangehow and the Nanking railroads, and one of the most important commercial centers of Asia; its annual exports and imports amounted to over \$270,000,000 before the World War. The imports are from Great Britain, India and other British colonies and consist of cotton goods, woolen goods, metals, petroleum, electrical apparatus and other machinery and numerous small wares. The exports are chiefly raw silk, manufactured silk, tea, rice, sugar, cotton, wool, paper and hides. The population in 1916 was estimated at 1,000,000, about one-half of whom live in the foreign quarters.

SHANNON, the largest river of Ireland, 250 miles in length, which flows into the Atlantic Ocean through a series of beautiful lakes, or loughs, along the southwestern coast. In the last sixty miles of its course, the Shannon becomes a tidal estuary, which at Limerick is thirteen miles wide. The river is navigable from Lough Allen to Limerick; two canals which connect it with Dublin have greatly increased its importance.

SHANTUNG, *shahng toong'*, a province on the east coast of China, the eastern part of which is a mountainous peninsula projecting into the Yellow Sea. On the Shantung promontory is the district of Kiao-chau, which China, under compulsion, leased to Germany in 1898. In 1914 Japan, as an ally of Great Britain, seized the district, including the port of Tsing-tau, and in 1915 the Japanese government obtained from China all mining and railway privileges in Shantung which Germany had previously enjoyed. These rights were retained by Japan at the close of the World War, by the terms of the Treaty of Versailles (see **VERSAILLES, TREATY OF**).

Shantung province has an area of 55,970 square miles, about that of the state of Wisconsin, and a population of 38,247,000. It is of economic value chiefly because of its mineral resources, which include four great coal fields and profitable iron mines. During the period of German concession a railway was built from Tsing-tau to Weihien, and westward to Tsinan-fu. All German leases are now held by Japan, which, however, does not hold political sovereignty over the province. Shantung is of historic interest as containing the birthplace and the grave of Confucius. See KIAO-CHAU; WORLD WAR.

SHARK, a group of flesh-eating fishes, the largest, most formidable and voracious of deep-sea monsters. They are common in almost all oceans, although most abundant in warm waters. The body is rounded and tapering, and is sometimes forty feet or more in length. The mouth is large, and is armed with several rows of compressed, sharp-edged teeth. The body is covered with a rough skin, and instead of scales, it has many tiny denticles. This skin is called *shagreen*, and it has a commercial value as a polisher of wood of fine grain, and as a covering for boxes (see SHAGREEN).

Sharks swiftly pursue other marine animals, and seem not to care whether their prey be living or dead. They often follow vessels and shoals of fishes in their periodical migrations.

Species of Sharks. The largest species is the *whale shark*, often more than fifty feet long. The *basking shark*, found chiefly in the Arctic Ocean; sometimes attains the length of forty feet, but it is not as ferocious as others of this group. The *white shark* is one of the most formidable and voracious; it is common in many of the warmer seas, reaching a length of over thirty feet. The *hammer-headed sharks*, which are chiefly found in tropical seas, are very voracious and often attack man. They are noteworthy for the remarkable shape of the head, which resembles somewhat a double-headed hammer, the eyes being at the extremities. Other forms are the *porbeagle*, the *blue shark*, the *fox shark*, the *sea fox*, the *sea ape*, or *thresher*, and the *Greenland*, or *northern*, *shark*. In China and Japan the smaller sharks serve as food, and in China and India the fins form an important article of commerce, as they contain a gelatin used in making soup. Oil is made from the livers of some species.

Shark Fishing. Shark fishing constitutes an important industry on the coasts of Lapland and Norway, as well as China, India and Africa. In Norway sharks are caught about 150 miles from the coast. Near the fishing boat a barrel pierced with holes and filled with oil is sunk. The oil attracts the shark, which is then caught by chains and hooks baited with salted seal meat. A great struggle ensues between man and the powerful monster before it is stunned by repeated heavy blows upon the head.

SHARON, *shair'on*, PA., in Mercer County, seventy-five miles northwest of Pittsburgh, near the Ohio boundary line, on the Shenango River and on the Pennsylvania, the New York Central, the Pittsburgh & Lake Erie and the Erie railroads. Coal is extensively mined in the vicinity, and there are rolling mills, furnaces, foundries, boiler works, machine shops and other factories. Stone quarrying is also an important industry. It was a munitions center during the World War. It was settled in 1795, and incorporated in 1841. Population, 1910, 15,270; in 1917, 19,156 (Federal estimate).

SHAS'TA, MOUNT, a lofty, snow-covered conical mountain, rising 10,000 feet above the plains of the Sacramento Valley, is a peak of the Sierra Nevada range of California, the summit of which is perpetually covered with snow. It is a typical volcanic mountain, attains the height of 14,350 feet above sea level, and is formed of two peaks. About 1,400 feet below the summit is a crater three-fourths of a mile in diameter and 2,500 feet deep. On the northern slope glaciers of considerable size are found. Other glaciers have left traces of their former existence in many glacial lakes and ponds.

SHAW, ALBERT (1857-), an American publicist and editor, born at Shandon, Ohio, and educated at Iowa (now Grinnell) College and at Johns Hopkins University. After several years of editorial writing and study abroad, in 1890 he established the *American Review of Reviews*, and as editor of the publication became known as one of the foremost editors of current-events periodicals. As a writer on political science he became equally well known. Among his books on municipal government and economics are *Coöperation in the Northwest*, *Municipal Government in Great Britain*, *Municipal Government in Continental Europe* and *Local Government in Illinois*.

SHAW, ANNA HOWARD (1847-1919), an American physician, lecturer and writer. Although an Englishwoman by birth, she was an American by education and long residence, having lived in the United States from early childhood. She was educated at Albion (Mich.) College and at Boston University, and received a medical and a theological degree. She was ordained in the Protestant Methodist Church in 1880, and she spent many years in the pulpit. Dr. Shaw gained her greatest prominence as an advocate of and lecturer on woman suffrage, chiefly from 1904 to 1915. In the latter year she published her autobiography, *The Story of a Pioneer*. During the World War she served as chairman of the Woman's Advisory Committee of the Council of National Defense. She died in the midst of active labors.

SHAW, GEORGE BERNARD, (1856—), a prominent Irish critic, essayist and dramatist. He was born in Dublin and in 1876 settled in London, where his critical writings soon brought him recognition. He took an active interest in politics as an advocate of Socialism, was an early member of the Fabian Society and gained notoriety as a pamphleteer and street orator. He wrote four novels—*The Irrational Knot*, *Love among the Artists*, *Cashel Byron's Profession* and *An Unsocial Socialist*—all of indifferent merit. It is as a critic and playwright that he has been most successful. Of his critical writings, *The Quintessence of Ibsenism* and *The Perfect Wagnerite* are noteworthy.

His first play, *Widowers' Houses*, produced in 1892, was followed by about twenty works for the stage, hardly any of which can properly be called plays, inasmuch as they ignore many principles of dramatic construction. His characters rarely feel or act; they merely argue usually on some social problem—and there is no emotional dramatic action. The plays which have aroused most interest are *The Philanderer*, *Candida*, *Major Barbara*, *Man and Superman*, *The Doctor's Dilemma*, *Getting Married*, *The Shewing-Up of Blanco Posnet* and *Fanny's First Play*.



GEORGE BERNARD
SHAW

SHAWNEE, an Indian tribe of Algonquian stock, who lived originally in South Carolina along the Savannah River. The Shawnees were vigorous and warlike, and numbered among their chiefs the famous Tecumseh (which see). They made unsuccessful attempts to resist white settlement. There are now about 1,400 in Oklahoma.

SHAWNEE, OKLA., in Pottawatomie County, nearly forty miles southeast of Oklahoma City, on the North Canadian River and the Atchison, Topeka & Santa Fé, the Chicago, Rock Island & Pacific and the Missouri, Kansas & Texas railroads. The Chicago, Rock Island & Pacific shops are located here and furnish work for hundreds of workmen. There are cotton gins and compresses and oil mills. The city has the Baptist University, the Catholic University and a Carnegie Library. Population, 1910, 12,474; in 1917, 19,051 (Federal estimate).

SHAYS' REBELLION, an insurrection in Western Massachusetts in 1786-1787, precipitated by the financial distress which followed the Revolutionary War. The special grievances of the insurgents were the high salaries paid to officials, excessive taxes and exorbitant fees of lawyers and officers. In September, 1786, a mob of about six hundred men gathered at Springfield under Daniel Shays, forced the supreme court to adjourn and attempted to capture the arsenal. The state militia under General Benjamin Lincoln soon overwhelmed them, and by February the revolt was quelled. Ten of the leaders were condemned to death, but were later pardoned by Governor John Hancock.

SHEBOYGAN, WIS., the county seat of Sheboygan County, fifty-two miles north of Milwaukee, on Lake Michigan, at the mouth of the Sheboygan River, and on the Chicago & North Western railroad. It is an important shipping point for the surrounding farming and dairying section. There are large cheese warehouses, coal docks, fisheries, chair and furniture factories, foundries, machine shops, carriage works, a piano factory, brickyards and various other establishments. The city has a state fish hatchery, a public library, a good Federal building, a county asylum for the insane, a home for the friendless and the Saint Nicholas hospital. There are two parks. The place was settled in 1836, the village was incorporated in 1846, and the city was chartered in 1853. Population, 1910, 26,398; in 1917, 28,907 (Federal estimate).

SHEEP, a cud-chewing animal, closely related to the goat, and one of the most useful of domesticated animals. Its wool is made into clothing, its skin is manufactured into leather and its flesh and milk are used for food. There are a number of varieties, but all are included under the classes known as coarse-wooled, medium-wooled and fine-wooled.

Breeds. There are numerous varieties of domestic sheep, but all can be classified under the following groups.

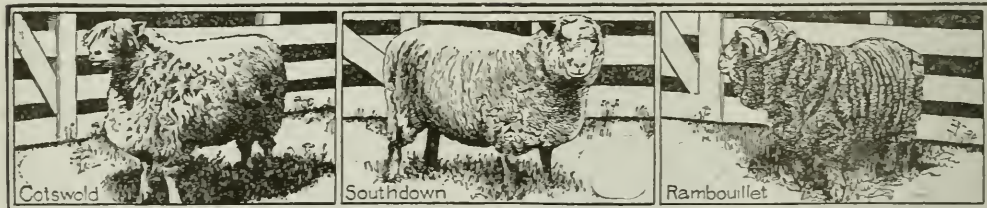
Coarse-Wooled. These breeds are characterized by their long, coarse wool, white faces and legs and straight backs. Their long wool makes them appear larger than they really are. The *Cotswold* is the long-wooled variety best known in America. Other varieties, common in the United Kingdom, are the *Leicester* and the *Lincoln*.

Medium-Wooled. The medium-wooled breeds are usually large in size and have compact fleeces, the wool being about one-half the length of that of the coarse-wooled breeds. One of the best known of these is the *Southdown*, which is easily distinguished by its large, compact body and its brown face and legs. Other valuable medium-wool breeds are the *Hampshire* and the *Shropshire*, both

states, particularly in Montana, Wyoming and Arizona. The *Rambouillet*, imported from France, is larger and stronger than the Merino, and is fast becoming a favorite with American growers.

Other Breeds. There are numerous other breeds of sheep, but with one or two exceptions they are of no economic importance. One of these is the sheep from which the so-called fur known as *astrakhan* and *Persian lamb* is obtained. The wool of this sheep is very fine and curly, which gives these furs a peculiar appearance. It is not known from what wild species the domestic varieties were bred. Wild sheep, such as the *Bighorn*, of the Rocky Mountains, are still found in the mountainous regions of Europe, Asia and America. It is probable that all wild sheep had horns, but they have now disappeared from the ewes of all domestic breeds except the *Dorset* and from the rams of most breeds.

Where Sheep are Raised. Domestic sheep are found in all parts of the civilized world, but they are most extensively raised in the temperate regions, where they are kept chiefly for the wool and flesh. The first sheep were brought to America by Columbus in 1493. The Spaniards introduced them into Mexico



somewhat larger than the Southdown. The Hampshire has become a favorite breed in America. The medium-wooled breeds are valuable for both wool and mutton, and are very generally raised.

Fine-Wooled. The *Merino* is the most important of the fine-wooled breeds. This sheep was introduced into America from Spain, where it has been bred for many centuries. It is small in size and has short legs, and the skin is wrinkled about the neck and shoulders. The wool is short, very fine and quite oily. It is the most valuable wool taken from sheep, and a fine cloth is manufactured from it. The Merino is delicate and will thrive only in a dry climate. These sheep are raised in large numbers in Australia, in New Zealand and in some of the Rocky Mountain

and Florida, and from these early flocks large herds descended. Other breeds were also brought by the English into the northern colonies, so that early in the history of the country the farms were stocked with sheep. Australia, New Zealand, Argentina, the Union of South Africa, Uruguay, Russia, the United Kingdom, France, Spain, India and the United States are the chief wool-producing countries of the world. In the United States, Montana, Wyoming, New Mexico and Ohio are the leading states. There are about 50,000,000 sheep in the United States, and about 9,000,000 are slaughtered annually. The yearly production of wool is about 200,000,000 pounds. Canada has over 2,000,000 sheep. See MEAT PACKING; MUTTON; WOOL.

SHEEP LAUREL. See KALMIA.

SHEEPSHEAD, *sheeps'hed*, the name of a fish abundant on the Atlantic coast of the United States, highly esteemed as a food. It receives its name from the resemblance of its head to that of a sheep. It is stout and deep-bodied, of a grayish color, with eight vertical bands and dark fins. It is rarely more than thirty inches in length.

SHEFFIELD, ENGLAND, in Yorkshire, 160 miles northwest of London, for more than two centuries noted for its manufacture of high-grade cutlery. The city is beautifully situated on hilly ground, at the junction of the Sheaf and the Don rivers. It has many fine buildings, among which are the ancient parish Church of Saint Peter's, in the Perpendicular style, recently restored; Saint Mary's Catholic Church; Albert Hall, and the Cutler's Hall. Of educational and literary institutions there are the Free Grammar School; the Church of England Educational Institute; University College, formerly the Firth College; the Wesley College; the School of Art, and the Saint George's Museum, founded by Mr. Ruskin. The trade of Sheffield is chiefly connected with cutlery, for which it has long been famous, and the manufacture of all forms of steel, iron and brass work. The steel manufacture includes armor-plating, rails, engine castings and rifles. There are also manufactures of engines, machinery, plated goods, Britannia metal goods, stoves and grates. Sheffield is supposed to have been originally a Roman station. Edward I granted it a charter as a market town in 1296. It is only since 1800 that it has developed such importance as a manufacturing center. Population, 1914, 472,234.

SHEIK, *sheek*, or *shayk*, an Arabic word meaning *aged man* or *elder*. Originally it was a title of dignity belonging to the chiefs of the Arabic tribes, but now is used among Moslems as a title of respect. The superiors of Mohammedan monastic orders and the heads of villages are sometimes called sheiks. The *grand mufti*, the head of the Mohammedan Church in Turkey, is known as the *Sheikh ul Islam*.

SHEKEL, *shek'el*, as originally used in the Bible, is a term referring to a unit of weight. Later it was applied to the coin also. The Hebrew coin, to which reference is most frequently made, was 218 grains in weight. It is said the Jews first issued coins of their own at the time of Simon Maccabaeus, between 141 and 134 B. C. The gold shekel was worth

about \$5.69, the copper about three cents, and the silver about fifty-four cents; the latter seems to have been given most wide circulation. In present day vernacular the word has come to refer to money in general.

SHELBYVILLE, IND., the county seat of Shelby County, twenty-five miles southeast of Indianapolis, on the Blue River and on the Cleveland, Cincinnati, Chicago & Saint Louis and the Pittsburgh, Cincinnati, Chicago & Saint Louis railroads. The city is in an agricultural, stock-raising and dairying region, and it contains flour mills, carriage works, creameries, nearly a score of furniture factories, as well as lumber and planing mills, ice factories and various other works. It has a city and a county building, a hospital, a sanitarium and a Carnegie Library. The Forest Hill Cemetery is also of interest. Population, 1910, 9,500; in 1917, 11,201 (Federal estimate).

SHELDON, CHARLES MONROE (1857-), an American clergyman and writer, born at Wellsville, N. Y. and educated at Brown University and at Andover Theological Seminary. In 1886 he was ordained in the Congregational ministry, subsequently filled pastorates at Waterbury, Vt., and Topeka, Kan., and ultimately became minister at large for his denomination. His experiment of editing the *Topeka Daily Capital* for one week on what he believed to be a Christian policy gained wide publicity. His books are all written with a purpose, and each illustrates some great moral principle. Some of them are *His Brother's Keeper*, *In His Steps*, *The Miracle at Markham*, *Who Killed Joe's Baby?* and *The Narrow Gate*.

SHELL, the hard outer coverings which form the chief protection of many of the lower animals. The Mollusks, the Echinodermata, the Crustacea and even certain insects, as the beetles, and certain mammals, as the armadillos, have such coverings. Perhaps the most interesting and typical shells are those of the mollusks, which are divided into two classes—the univalves (single valves) and the bivalves (two valves). The most common examples of the univalves are the shells of common snails, which assume a variety of graceful shapes and beautiful colors. Some are long spirals, tapering to a point; some are tightly wound wheels, like a watch spring, and some are short, round spirals, with wide openings. Some of these shells are delicate, with a pearly luster, while others are heavy.

Of the bivalves—shell formed of two parts, joined by a hinge—the best examples are the clam and oyster shells. The most easily noted characteristics of these very common shells are the different layers of which they are composed—the outer horny layer, or epidermis, and the beautiful inner pearly layer. There are endless varieties of both univalve and bivalve shells, some so small as to be indistinguishable as shells, some very large; and all of these have been put to many uses. They have been used as ornaments by civilized and uncivilized peoples, as material for the making of buttons and other objects, and as money. The study of shells and of shelled animals is called *conchology*.

Related Articles. Consult the following titles for additional information:

Abalone	Cowrie	Mussel
Cameo	Mollusca	Nautilus
Clam	Mother-of-	Oyster
Conch	Pearl	Snail

SHELL, originally a hollow projectile, filled with a bursting charge of gunpowder or other explosive composition and fitted with a fuse by which to fire it at the desired time. Shells are usually made of cast iron or steel, and are elongated.

There are many different kinds and sizes, and the meaning of the term has been expanded to include all projectiles fired from cannons. Shells used in field artillery are constructed differently from those used in the navy. Projectiles used in the navy are designed to penetrate the steel armor of warships, and are very heavy. They have a sharp point and are tempered to the highest degree of hardness. A 12-inch gun fires a projectile weighing 981 pounds, and a 14-inch gun, one weighing 1,400 pounds, for an average distance of twelve miles, although in the World War the Germans built a gun which projected a shell over seventy-five miles, into Paris. Such a projectile has a striking force that will penetrate any armor.

SHELLEY, PERCY BYSSHE (1792-1822), an English poet born at Field Place, Horsham, Sussex, the son of Sir Timothy Shelley, a landed proprietor of ancient family. He was educated at Sion House Academy, Brantford, at Eton and at University College, Oxford. At Sion House and at Eton on account of his temperament he was persecuted by his fellows, and thus he early began to show that fierce hatred of oppression which characterized him throughout his life. While at Oxford he showed himself possessed of

uncommon literary ability; but he fell into disfavor with the authorities on the publication of a pamphlet called *The Necessity of Atheism* and was expelled. In 1811, shortly after his expulsion from college, he eloped to Edinburgh with Harriet Westbrook, the daughter of a retired innkeeper, but sixteen years of age. The marriage turned out unhappily, and after nearly three years of a wandering unsettled life they separated. In November,



PERCY BYSSHE
SHELLEY

1816, Harriet committed suicide by drowning. Shelley was deeply affected by this event, but soon after he married Mary Godwin, with whom he had visited the Continent in 1814.

Partly because his lungs were affected and partly because he feared that he should be deprived of the children of his second marriage, on account of his atheism, as he had been deprived of those of his former marriage, Shelley left England finally in March, 1818, and the whole short remainder of his life was passed in Italy. On July 8, 1822, while he was sailing in the Bay of Spezia, a storm arose and he was drowned. According to the quarantine laws of Tuscany the body was burned, and the ashes were deposited by his friends in the Protestant burying ground of Rome.

From his youth Shelley's life was a constant battle in defense of the radical revolutionary principles he had adopted. He believed in the possibility of establishing an ideal society, in which such institutions as marriage and property should be subordinate to the development of individuals. In some of his poems, *Queen Mab*, his earliest important work, written when he was eighteen, *The Revolt of Islam* and *Prometheus Unbound*, he embodied his beliefs on the reconstruction of society. The poems of Shelley, however, which have remained most popular, are characterized, rather, by a delicate fanciful beauty, than by any openly expressed spirit of revolt. Shelley was one of the great lyric poets of England, and his gift of wonderful melody, grace and lightness shows best in such poems as *Ode to the West Wind*, *The*

Cloud, Ode to Liberty, Ode to a Skylark, To Night and Lines to an Indian Air.

SHENANDOAH, PA., in Schuylkill County, 105 miles northwest of Philadelphia, on the Pennsylvania, the Lehigh Valley and the Philadelphia & Reading railroads. There are also electric railways to neighboring towns. It is in a rich anthracite coal field, and mining is the principal industry. The Greek Catholic church here was one of the first of that denomination, to be established in the United States. The borough has a public library, national banks, a savings bank and building and loan associations. It was settled in 1850 and was incorporated in 1866. Population, 1910, 25,774; in 1917, 29,753. (Federal estimate).

SHENANDOAH RIVER, a river of Northwestern Virginia, 300 miles in length, flowing northeastward into the Potomac, which it enters at Harper's Ferry. Its valley, formed by the Blue Ridge and central Appalachian Mountains and noted for its fertility and beauty, was the scene of numerous military operations during the Civil War. See **SHERIDAN, PHILIP HENRY**.

SHEPARD, HELEN GOULD (1868-), an American philanthropist, the eldest daughter of Jay Gould. Among the first of her famous benevolencies was a gift of \$100,000 to the United States government at the opening of the Spanish-American War, for improvement in the equipment of the hospital and commissary service, and a donation of \$50,000 for military hospital supplies. A library building and an engineering school to New York University, the naval branch building and equipment of the Brooklyn Y. M. C. A. and a fund for improvements at Rutgers College, the total amount approximating a quarter of a million dollars, are among her other donations. Many smaller gifts have been made to various causes. Miss Gould was married to Finley J. Shepard, a railway official in 1913.

SHEPHERD DOG, the general name of a group of dogs, of which the finest breed is the Scotch collie, employed originally by shepherds to assist in tending flocks. The small Spitz, or Pomeranian, also belongs to this family. The shepherd dog generally is large, of powerful, lithe build, and is remarkable for its intelligence and usefulness. The tail is rather long and possesses a bushy fringe, the muzzle is notably sharp, and the eyes are large and bright. See **COLLIE**.

SHERATON, *sher' a ton*, **THOMAS** (1751-1806), an English designer of furniture which bears his name, was born at Stockton-on-Tees. He went to London in 1790 and soon after published his books, *Cabinet-Maker and Upholsterers' Director*, *Cabinet Dictionary*, and *The Cabinet-Maker, Upholsterer and General Artists' Encyclopedia*, each profusely illustrated with engravings and colored plates of the designs with which his name has become identified. He was always extremely poor, and never seems to have had a shop of his own, although his books had a wide circulation and much furniture was made from his original designs. Sheraton's name will always be connected with furniture decorated with painted designs. He was also noted for his use of inlay. See **FURNITURE**.

SHERBROOKE, *shur'brook*, **QUE.**, at the junction of the Saint Francis and Magog rivers, 101 miles east of Montreal, on the Grand Trunk and the Boston & Maine railroads. The rivers furnish good water power, and the city is quite an important industrial center. Among the leading manufactures are woolen cloths, flour, foundry products, tools, lumber, wood pulp, paper and malt liquors. Population, 1911, 16,405.

SHERIDAN, **WYO.**, the county seat of Sheridan County, on the Chicago, Burlington & Quincy Railroad. Coal is mined in the vicinity, the city is a stock-shipping point, and there are manufactures of agricultural implements. A Carnegie Library and a state hospital are here. The town was settled in 1882, and was incorporated in the next year. Population, 1910, 8,408; in 1917, 13,407 (Federal estimate).

SHERIDAN, PHILIP HENRY (1831-1888), an American soldier, probably the greatest cavalry leader of the Civil War, born in Albany, N. Y. He was graduated at West Point Military Academy in 1853, and from 1855 to 1861 served on the frontiers of Texas and Oregon. At the outbreak of the Civil War he was a captain in the Thirteenth Infantry, but in the following year he was made colonel of the Second Michigan Cavalry. Later in the year he was placed in command of the Army of the Ohio, and in the battles of Perryville, Murfreesboro, Chickamauga and Chattanooga, he showed the greatest ability and bravery. In April, 1864, Grant appointed him chief of cavalry of the Army of the Potomac, and he made several daring cavalry raids into the Shenandoah Valley.

His ride from Winchester to Cedar Creek, a distance of twenty miles, which turned a Federal defeat into a brilliant victory, is his most famous exploit. During the final advance upon Richmond he was Grant's right-hand man. He fought the Battle of Five Forks, which necessitated Lee's evacuation of Richmond and Petersburg; and as Lee fled he constantly harassed and attacked him, until he compelled his surrender at Appomattox Court House,



PHILIP SHERIDAN

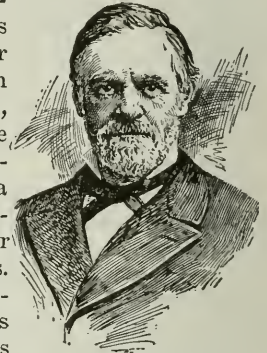
April 9, 1865. After the war he held various military commands. In March, 1869, he became lieutenant-general, and in February, 1884, on the retirement of Sherman, commanding general of the army.

SHERIDAN, RICHARD BRINSLEY BUTLER (1751-1816), a British dramatist and statesman, born in Dublin. His first famous comedy, *The Rivals*, was produced in 1775, and this was followed by *The Duenna*, a comic opera; *The School for Scandal*, the greatest English comedy which had been produced since Shakespeare; *Saint Patrick's Day*, a farce, and *The Critic*, a comedy. After the destruction by fire of his Drury Lane Theater, London, the closing years of Sheridan's life were handicapped by continued financial difficulties. His charm of personality and wit made him a conspicuous figure in London literary life and society. He also won fame as an orator during his twelve-year Parliamentary career, especially for his speeches on the impeachment of Warren Hastings. Burial was in Westminster Abbey.

SHERIFF, *sher'if*, the chief executive officer of a county. In England since the early part of the fourteenth century the office of sheriff has been appointive. In the United States, there are a few states in which the sheriffs are appointed, but the office is generally elective, and cannot be held for more than two successive terms. In the two countries the duties of sheriff are practically the same. He is charged with the safe-keeping of prisoners, with the proper conduct of juries, and is expected to keep the peace. His duties include the seizure of property

when a warrant of attachment has been issued, and the sale of property to satisfy a judgment. In populous counties a sheriff has several assistants, called deputies, and there are many perquisites to his office in the form of fees, often making it highly lucrative.

SHERMAN, *shur'man*, JOHN (1823-1900), one of the most influential statesmen of his day, and author of the famous silver and anti-trust laws which bear his name. Sherman was born in Lancaster, Ohio. He was admitted to the bar in 1844, and began practice at Mansfield, from which city he was elected to Congress in 1855. As a speaker he was an acknowledged power from his early years. In 1861 Sherman became United States Senator, and as chairman of the



JOHN SHERMAN

Ways and Means committee did much to strengthen the public credit during the Civil War and after. He was appointed Secretary of the Treasury under President Hayes in 1877, and succeeded in accumulating a sufficient gold reserve for the resumption of specie payment. He served continuously as United States Senator from 1881 until 1897. During this period he secured the enactment of the Antitrust Law (see TRUSTS) and the Sherman Silver Act. He became the Secretary of State of President McKinley's Cabinet in 1897, but at the outbreak of the war with Spain, on account of advanced age and failing powers, he resigned this post and retired to private life. William Tecumseh Sherman, his brother, was a distinguished Federal general in the Civil War.

SHERMAN, ROGER (1721-1793), an American patriot, one of the signers of the Declaration of Independence, was born at Newton, Mass. As a boy he was apprenticed to a shoemaker, but in 1743 he engaged in business with his brother at New Milford, Conn., and was later admitted to the bar. Before the Revolutionary War he had served in the Connecticut legislature, as a judge of the superior court of Connecticut, and as a member of the Connecticut senate. He was a member of the committees that framed the Declaration of Independence and the Articles

of Confederation. In 1784 he was elected mayor of New Haven. While holding this office Sherman was an influential member of the Constitutional Convention at Philadelphia (1787). He was one of the first Representatives in the Federal Congress from Connecticut, and in 1791 was elected to the Senate, where he served until his death.

SHERMAN, TEX., the county seat of Grayson County, about sixty miles north of Dallas, on the Frisco, the Atchison, Topeka & Santa Fé, the Texas & Pacific, the Houston & Texas Central, the Missouri, Oklahoma & Gulf and the Saint Louis Southwestern railroads. The city has an elevation of about 1,000 feet above the sea. It is in the fertile Red River Valley, where much cotton is raised, and is not far from the Ardmore coal fields of Oklahoma. It ships large quantities of cotton and grain and contains a large cotton gin, several cottonseed oil mills, flour and lumber mills, machine shops, brick works and other factories. The higher educational institutions are the North Texas Female College, the Carr-Carleton Christian College for women, Austin College for boys and North Texas Female College (Methodist). The municipality has a Carnegie Library, a Y. M. C. A. and a Federal building, and owns and operates the waterworks. Sherman was settled in 1848, and was chartered as a city in 1895. In 1915 the commission form of government was adopted. Population, 1910, 12,412; in 1917, 13,848 (Federal estimate).

SHERMAN, WILLIAM TECUMSEH (1820-1891), an American general, born at Lancaster, Ohio, and educated at West Point Military Academy. He served in the army in Florida and Mexico, and in 1853 retired to private life. On the outbreak of the Civil War he offered his services to the United States government and was appointed colonel of the Thirtieth Infantry. He was present at the Battle of Bull Run, greatly distinguished himself at Shiloh and subsequently took a prominent part in the operations under Grant around Vicksburg and Memphis. Transferred to Tennessee, he



WILLIAM TECUMSEH
SHERMAN

rendered Grant great service in the operations around Chattanooga, and early in 1864 he led his forces in a raid across Mississippi, devastating the country from Jackson to Meridian. In March, 1864, he succeeded Grant as commander of the military division of the Mississippi, and at the beginning of May, simultaneously with Grant's advance in the East, he began his invasion of Georgia. On September 1, after a number of battles, he took Atlanta, and on December 21 entered Savannah. Then, turning northward into the Carolinas and fighting more battles, he received the surrender of General Joseph E. Johnston at Durham's Station, April 26, 1865, a surrender which brought the war to a close. Sherman was made a major-general in 1864, lieutenant-general in 1866 and general in 1869. When Grant became President in 1869, Sherman was made commanding general of the United States army. He was retired in 1884. In 1875 he published his *Memoirs*, in two volumes.

SHERRY, *sher'i*, a Spanish wine, made in the neighborhood of Jerez, in the province of Andalusia, near Cadiz, the location of the choicest vineyards of Spain. Dry sherry is the most highly prized. It is a strong wine, esteemed for its delicate flavor. Sherry is more largely imitated and adulterated than any other wine. A light white beverage, in imitation of Spanish sherry, is made in California. See WINE.

SHETLAND ISLANDS, a group of islands, the most northerly possession of Great Britain in Europe, lying at about the junction of the Atlantic Ocean and the North Sea, northeast of Scotland. They number about 100, of which twenty-three are inhabited, and cover an area of about 556 square miles. The largest of the Shetlands is Mainland.

The surface is rugged, and the coasts have many indentations, lined with abrupt cliffs of gneiss, sandstone and granite. The climate is variable, but moderate both as to heat and cold. Fishing forms the chief industry, the cod, the ling and the herring being leading articles of commerce. The raising of cattle, sheep and ponies is also an important industry, the Shetland ponies being especially famous. The chief agricultural products are oats and barley; in manufactures, hosiery and shawls take the lead. Interesting relics of the Stone Age (which see) are found on the Shetlands. These have been much studied by the world's scientists.

SHIELD, *sheeld*, a piece of armor carried on the left arm or in the left hand as a means of defense to ward off missiles and sword blows. Varied in form and size, it was the prime means of protection in battle from earliest times to the introduction of firearms.

In the early Middle Ages, foot soldiers as well as horses were protected by shields. Then the heraldic devices on the shields were the only means of identification of friend or foe, as in battle the men were completely incased in suits of armor (see **HERALDRY**). If held at arm's length, the shield was called a *buckler*; if swung over the arm with the arm across the body, it was known as a *target*. The shield of the ancient Greek infantry almost covered the entire body; that of the Romans was much lighter and smaller.

The Vikings hung their shields over the sides of ships when embarking upon an adventure. In the eleventh century it was customary to carry dead knights from the battlefield on their shields. The Spartan mother, upon the departure of her warrior sons for battle, bade them to return with or on their shields. In the thirteenth century the custom of hanging shields in churches was introduced.

Shields of savage races are most generally made of oxhide, which is hardened to resist penetration of spears and darts. In modern warfare the shield has an unimportant place as a protection to machine guns, and this use now, too, is on the decline. A metal shield protects those firing larger guns, such as six-inch field pieces.

SHIITES, *she'ites*, the lesser of the two great sects of Mohammedans. They do not acknowledge the *Sunna* as a law, and believe that Ali, the fourth caliph after Mohammed, was his first lawful successor. Persia is now the only Shiite nation of importance.

SHILLABER, *shil'a ber*, BENJAMIN PENHALLOW (1814-1890), an American humorist, whose amusing sketches gained wide popularity, written under the pen name of Mrs. PARTINGTON. He was born at Portsmouth,

N. H., became a printer and was engaged in this occupation at Dover, N. H., and at Boston until 1847, when he joined the editorial staff of the *Boston Post*, and later the *Saturday Evening Gazette*. Among his well-known books are *Life and Sayings of Mrs. Partington*, *Partingtonian Patchwork*, *Rhymes with Reason and Without* and *Ike and His Friends*.

SHILLING, *shil'ing*, an English silver coin, equivalent in value to twelve bronze pence, or one-twentieth of a pound sterling, and approximately equal to 24.3 cents, to 1.25 French francs, and to 1.11 German marks. The convenient size and value of the English shillings made them popular in the American colonies, but, like the pound unit, in the colonies they varied greatly in value. A few coins of this denomination were issued by the colonies, notably the famous pine tree shilling of Massachusetts (which see). The shilling is still used as a money of account in parts of the United States, its most common value being about 12½ cents, or ¼ of one dollar.

SHILOH, *shil'o*, in Biblical literature a city of the tribe of Ephraim. It was one of the oldest and most sacred of the Hebrew sanctuaries. After they had subjugated Canaan, the Children of Israel erected the tabernacle there and set up the Ark of the Covenant, at which the family of Eli officiated. According to Biblical account the ungodly conduct of the sons of Eli brought about the loss of the Ark, which had been carried into battle against the Philistines. From that time Shiloh steadily declined. The only remains of the ancient village are rock tombs and a pool formed by a hollow cut in rock. The place is to-day called Seilun.

SHILOH, BATTLE OF, one of the most memorable battles of the Civil War, fought on April 6 and 7, 1862 about two miles west of Pittsburg Landing, on the Tennessee River, in Tennessee, around a log chapel known as "Shiloh Church." Grant and Sherman commanded the Federals, and A. S. Johnston and Beauregard led the Confederates. On April 6, the Confederates took the Federals by surprise and drove them from their lines, with heavy loss in men and guns; but the second day the Federals, having received reënforcements under generals Lew Wallace and D. C. Buell and largely outnumbering the Confederates, regained their first position and forced the Confederates to retreat to Corinth.



ROMAN SHIELDS

By their defeat at Shiloh the Confederates lost 10,700 men, including Gen. A. S. Johnston, and their hold on Tennessee west of the mountains. The Federal forces lost 13,000 men.

SHINGLES, thin pieces of wood used chiefly for covering the roofs of buildings. They are of the uniform length of eighteen inches, three-eighths of an inch thick at one end and tapering uniformly to about an eighth of an inch at the other end, and vary in width from three to eight inches. Shingles are packed 200 in a bunch. Roofing is measured by the square, that is, by areas of 10 feet square, or 100 square feet. Usually shingles are laid $4\frac{1}{2}$ inches to the weather. As $4 \times 4\frac{1}{2}$ equals 18, each shingle will cover 18 square inches of roof. It requires eight shingles to cover a square foot, or 800 to cover a square. But this does not allow for waste, and carpenters usually reckon 900 shingles to the square.

To find the number of shingles required to cover a roof, divide the area of the roof in square feet by 100 and multiply the quotient by 900; divide this product by 200, and the result will be the number of bunches required.

SHINNEY. See HOCKEY.

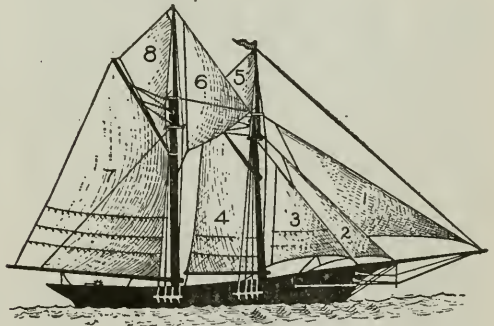
SHINTOISM, *shin'toh is'm*, the ancient religion and mythology of the Japanese, the least developed of all the great religions, having no supreme deity or moral code. In its origin it was a form of sun worship, but the essence of the religion is now ancestor worship and sacrifice to departed heroes. After the introduction of Buddhism the priests of Shintoism became magicians and fortune tellers. With the overthrow of the shogun, Shintoism again took the place of Buddhism. However, it has not been able to maintain itself as a religion, and has become rather a code of ceremonies.

SHIP. The first man to ride on the water rode astride a log. He may then have joined two logs together, to accommodate more men. Later he hollowed out the trunk of a tree to make a canoe, which was the first form of a boat. From these humble beginnings thousands of years ago, the shipbuilding industry has developed to its present gigantic proportions. There is not a body of water in the habitable parts of the earth that is not navigated by some form of water craft. Today ships bind together the nations of the earth and bring to the ports of each the products and people of all others.

There's not a ship that sails the ocean,
But every climate, every soil,
Must bring its tribute, great or small,
And help to build the wooden wall.

The term *ship* as now used applies to all large vessels upon either salt or fresh water, excepting those which ply upon rivers only. There are many patterns of ships, but all belong to one of two general classes—sailing vessels and steamships.

Sailing Vessels. Without doubt the first sail was the top of a small tree or a branch laden with foliage. From this it was not a difficult step to the use of skins of animals, which were stretched on poles that took the place of the mast in ships of later construction. However, this may be, ships with sails were in use long before we have any recorded history of civilization. The oldest sailboat or ship of which we have any record is that of the ancient Egyptians, shown in full-page illustration. It dates from a period at least 6000 B. C. A study of this picture will show that in this primitive craft are the lines and curves that, with slight modifications, are found in the hulls of modern ships. The Egyptians were not a sea-faring people, and their development of ships did not extend to sea-going craft.



A SAILING VESSEL

1. Flying jib
2. Jib
3. Fore staysail
4. Foresail
5. Fore gaff topsail
6. Main topmast staysail
7. Mainsail
8. Main gaff topsail

The Phoenicians, the greatest commercial people of antiquity, made considerable progress in the art of shipbuilding; the Romans also had a well-developed art. But with the tide of barbarism which swept over Europe at the downfall of the last great ancient empire, the science of shipbuilding was almost lost, and the Western peoples, to whom the

world's progress was henceforth entrusted, were compelled to begin anew and build up, from their own resources, new models. For more than a thousand years after the beginning of the Christian Era navigation was practically confined to the Mediterranean Sea. The first people to brave the dangers of the open ocean at that time were the Norsemen, who reached America in their Viking ships, nearly five hundred years before Columbus. These ships were long, low and narrow, and were propelled by both oars and sails. The chief events which gave impetus to the development of shipbuilding were the invention of the compass, the discovery of America and the finding of a passage to India. Spain, the great maritime nation of the early modern era, followed by France and Holland, and later still by England, made the first important advances. The last of these nations has the credit for building the first three-decker (1637), known as the *Sovereign of the Seas*. This was the most famous warship of its day. It was 168 feet long, forty-eight feet in the beam, mounted 100 guns, and cost \$1,500,000.

Between the fifteenth century and the advent of the steamship many types of sailing vessels were developed, but they can all be brought under two general classes—the *square rigged* and the *fore-and-aft rigged*. The *Sovereign of the Seas* affords a good illustration of the first, and any schooner is a good example of the second class. The square-rigged ship was the first style of merchant ship to sail on long voyages, and for more than a century it was the common carrier between maritime nations.

In The United States. The colonists in New England began to build ships and engage in foreign trade soon after they had founded their settlements, and before the outbreak of the Revolutionary War they had a good number of ships to their credit. Many of these, however, they lost during that struggle. After the independence of the United States was achieved it rapidly forged to the front and soon took the lead in the art of shipbuilding. In 1832, Scott Russell demonstrated the theoretical principles upon which the speed of ships is based, and these were immediately applied with success by both American and foreign builders. The Baltimore clipper schooners were the first results of the application of true principles of construction. They had sharp bows and deep

stern, were very long and lay low in the water, had long, slender masts and large, skillfully cut sails. The construction of vessels on these principles gave faster, safer ships than had been known before, and these played a large part in the development of the oriental trade of both England and America.

For many years the schooner was in common use for coastwise traffic and on the Great Lakes. A schooner is a fore-and-aft rigged vessel usually having two masts and a bowsprit, though the number of masts may be increased with the size of the vessel. A good schooner is a fast sailer, and can be managed by a small crew. The largest ship of this type ever constructed was a steel seven-mast schooner, 305 feet long, 50 feet beam, having a displacement of 10,000 tons and carrying 40,617 square feet of canvas.

Steamships. The first successful steamboat was the *Clermont*, invented by Robert Fulton in 1807 (see FULTON, ROBERT). Previous to Fulton's venture several attempts had been made to propel boats by steam, and one inventor, John Fitch, was successful, but his boat was small, and not commercially practical. John Stevens of New Jersey completed a steamboat soon after the *Clermont* made its first voyage. He took his boat to the Delaware River by sea, and was the first to navigate the ocean in a vessel propelled by steam. For thirty years after Fulton's invention, paddle wheels were used exclusively for propelling steamships. Between 1840 and 1845 John Ericsson perfected the screw propeller, which rapidly replaced the paddle wheel and is now almost universally employed on steamships.

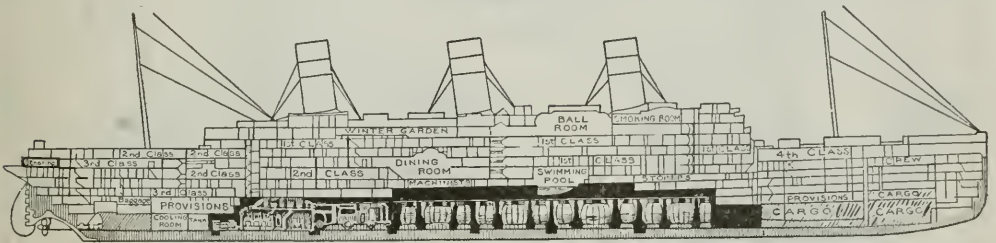
The first steamship to cross the ocean was the *Savannah*, which made a voyage to England and Russia in 1819. It used both sails and steam. Within the next twenty years steamships multiplied so rapidly that they were found on the waters of all civilized parts of the globe. Until the perfection of Ericsson's propeller the plan of using both sails and steam was followed on ocean steamships, but with the introduction of the propeller the plan of construction was radically changed, and the first steps leading to the modern ocean-going ships were taken. Previous to this change all ships were constructed of wood, but gradually iron, then steel, began to replace wood, until the wooden ship was almost driven from the seas and the Great Lakes. The emergency caused by the World

War revived for a short time the interest in wooden ships, and in 1917 and 1918 a number were built in America under the supervision of the government, but when the emergency had passed this form of construction was abandoned. Since 1917 concrete has been used in the construction of a number of ships.

Modern Steamships. The modern ocean liner of the highest type is one of the marvels of the age. It is as luxurious as a modern hotel, and carries, besides its crew, a passenger list equal to the population of a small-sized city. It is evident that the science of ship designing is at once important and intricate. The chief points to be considered are

level with the surface of the water. American and Canadian ships have the draught in feet marked in large figures (usually Roman numerals) on the bow, so that anyone can tell the draught by looking at these figures. Careful observation of the draught and the load line by the navigator is essential to safety. Many ships have been wrecked because they were overloaded.

The completion of the *Lusitania*, destroyed by a German submarine in 1915 (see LUSITANIA), and its sister ship the *Mauretania*, was considered to mark a new era in ocean transportation. Steam turbines took the place of the old-styled reciprocating



TRANSVERSE SECTION OF GREAT STEAMSHIP

The *Imperator*, sister ship of former *Vaterland*, now *Leviathan*. Length, 909 feet; beam, 98 feet; displacement, 58,000 tons; horse power 62,000; speed, 23 knots per hour (over 26 miles).

stability, capacity, strength and speed. The ship must have graceful lines, and in addition to its capacity for cargo must be able to carry a certain number of passengers. Its engines must be capable of propelling it at a certain speed, and the shape must be conducive to allowing such speed with economy of fuel; the ship must be able to stow enough coal to last during the trip at a rate of about 1,000 tons a day, for fast boats like the *Mauretania*, and about 260 tons for the larger, slower boats. The liner must be safe, but light, must withstand shocks firmly and must be built so that it will return to erect position when turned slightly to the side.

The *displacement* of the ship means the weight of the water it displaces, which weight is equal to that of the ship with cargo and passengers. The *draught* of the ship is the depth to which the lowest part of the keel sinks below the surface of the water when the boat is loaded. When the navigator says that his ship draws twenty feet of water he means that the lowest point of the keel will be twenty feet below the surface when the ship is loaded to fullest capacity. The *load line* is the plane passing through the ship on the

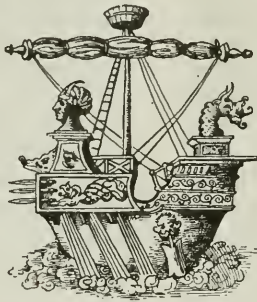
engine; each ship was driven by four propellers and made an average speed of about twenty-five knots, or nearly thirty miles, an hour. The *Mauretania* has a width of 88 feet, is 60 feet deep, has gross tonnage of 33,000 tons and a displacement of 46,640 tons. It will accommodate 550 first-class passengers, 375 second-class and 1300 third-class passengers, and requires a crew of 800. The electric lighting plant required over 200 miles of cable and a dynamo larger than that necessary for a good-sized town. Its consumption of coal averages over 1,000 tons a day, and 350 men are required to attend to the fires. This ship is fitted with every convenience and luxury that can be found in the most select hotels of Europe or the United States, as well as with the latest devices to insure safety. It makes the voyage between New York and Liverpool in less than five days.

Since the completion of the *Mauretania* the White Star line has constructed the *Olympic*, having a length of 850 feet, but that has been exceeded by the *Imperator* (909 feet) and the *Vaterland* (950 feet) built by the Hamburg-American line. At the time of its completion in 1914, the *Vaterland* was the largest ship

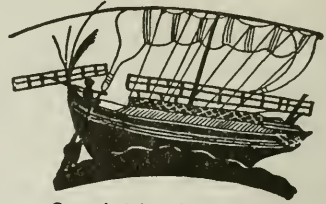
SHIPS IN ALL AGES



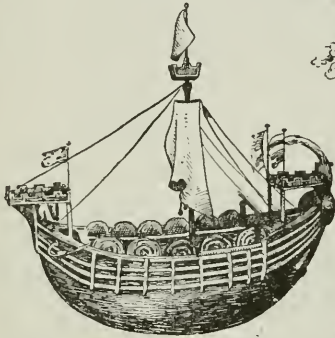
Egyptian,
about 6000 B.C.



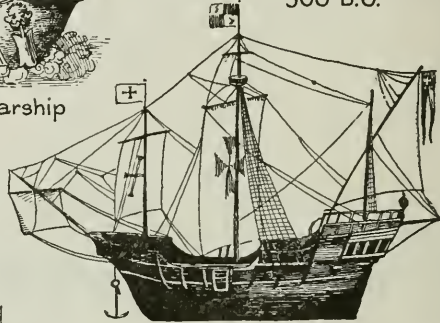
Roman Warship



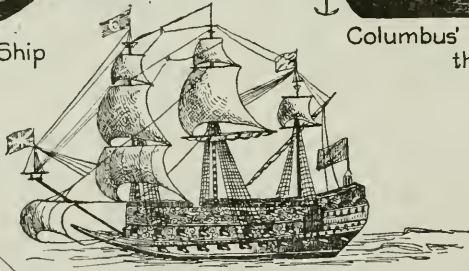
Greek Merchantman,
500 B.C.



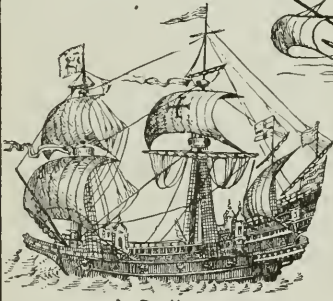
13th Century English Ship



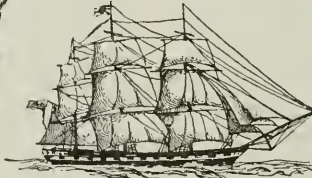
Columbus' Flag Ship,
the "Santa Maria."



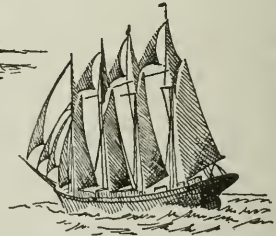
The "Sovereign of the Seas"
Built 1638



A Galleon
of the Time of Elizabeth



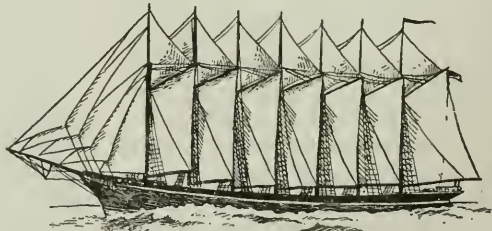
The "Newcastle,"
an East Indiaman



American Four-masted
Schooner



Baltimore Clipper

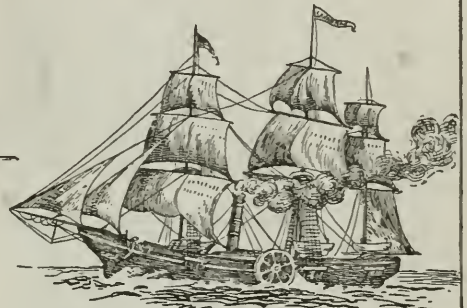


The First Seven-masted Steel Schooner

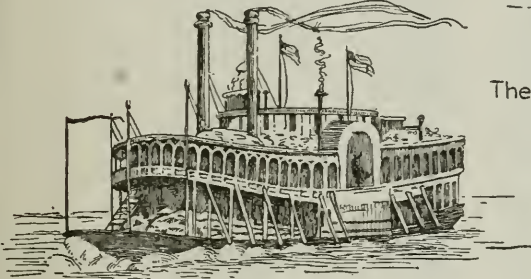
SHIPS IN ALL AGES



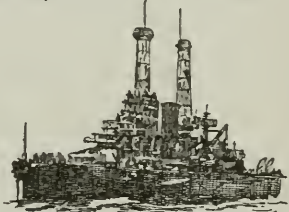
Fulton's Clermont
Speed, Five Miles per Hour



The Savannah
The First Steam Vessel to Cross the
Atlantic, 1819



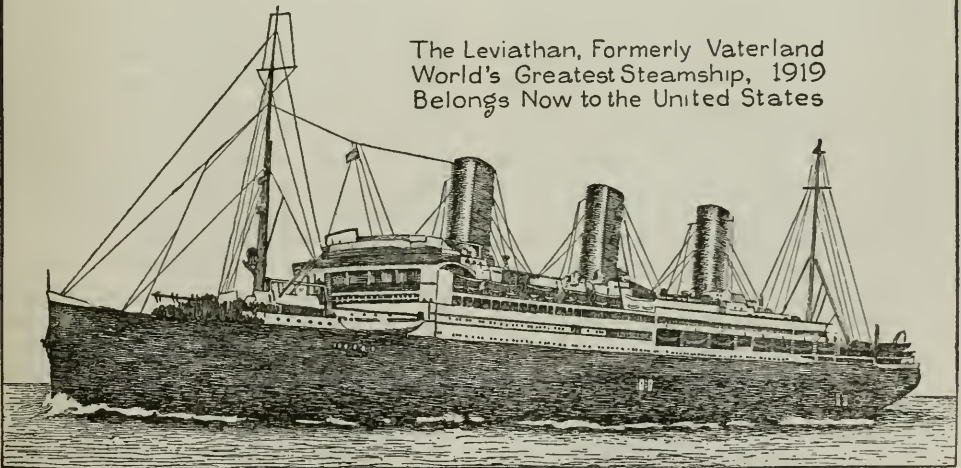
Mississippi River Steamer



Battleship, 30,000 tons



Ore Boat on Great Lakes, 1919. Capacity, 14,000 tons.



The Leviathan, Formerly Vaterland
World's Greatest Steamship, 1919
Belongs Now to the United States

afloat. Although these ships are larger than the *Mauretania*, they are not so swift.

The *Vaterland* was interned at New York at the outbreak of the World War. It was damaged by the crew to prevent its becoming of use to any other nation, but when the United States entered the war, the great ship was taken over by the government, repaired, rechristened the *Leviathan*, and placed in service under the American flag. It was invaluable in transporting troops to and from Europe.

Freight ships differ from passenger ships chiefly in being lower, and in having less powerful engines. A peculiar type of freight ship used on the Great Lakes for carrying ore, coal and grain is very low in the water and has a large carrying capacity. The hull is so constructed that the ship can be unloaded in a few hours by the use of mechanical devices.

Other Power Boats. Small boats propelled by gasoline engines are common as pleasure crafts on all small bodies of water. The success of these boats has led to the construction of small ships propelled by similar engines, and they are found to be economical for short voyages in transporting both freight and passengers.

Ships and the World War. Excepting the *Lusitania*, the names of ships destroyed by submarines or mines do not appear in the following list. According to the official report issued in London after the signing of the armistice, the total loss of merchant ships for the world on account of the war amounted to 15,053,378 tons; 2,475 British and 145 American ships were destroyed by submarines or mines. Among the neutral nations, Norway suffered most, losing 831 ships; Denmark lost 249; Sweden, 178.

In Great Britain and the United States new ships were built so rapidly that fully two-thirds of their losses were replaced by new ships, but the neutral countries were unable to replace the ships destroyed. At the close of the war the merchant marine of Great Britain held first place, and the United States had risen from an insignificant position to that of second place in both its navy and its merchant marine.

Notable Marine Disasters. The navigation of the seas from the earliest times has resulted in frequent disasters, involving serious losses of life. Many of these were due to acts of God, to storms or other cir-

cumstances beyond the control of men. A few were due to attacks by enemies, and others were caused by carelessness or negligence. Of the thousands of disasters which mark the history of navigation, only a few of the most noteworthy are listed below:

NAME OF SHIP	PLACE	DATE	CAUSE	DEAD
Association	Scilly Islands	Oct. 22, 1707	Wreck	800
Prince George	Gibraltar	Apr. 13, 1758	Fire	400
Royal George	Spithead	Aug. 29, 1782	Wreck	600
Queen Charlotte	Leghorn	Mar. 17, 1800	Fire	673
St. George	Jutland Coast	Dec. 24, 1811	Wreck	630
Defense	Jutland Coast	Dec. 24, 1811	Wreck	600
Royal Adelaide	Margate	Mar. 30, 1850	Wreck	400
Birkenhead	African Coast	Feb. 26, 1852	Wreck	454
City of Glasgow	At Sea	Mar. 1854	Unknown	450
Central America	At Sea	Sept. 12, 1857	Wreck	400
Austria	Mid-Atlantic	Sept. 13, 1858	Fire	471
Lady Elgin	Lake Michigan	Sept. 8, 1860	Collision	287
Captain	Off Finisterre	Sept. 7, 1870	Wreck	422
Atlantic	Off Nova Scotia	Apr. 1, 1873	Wreck	547
Cospatrick	Mid-Atlantic	Dec. 6, 1874	Fire	470
Princess Alice	Thames River	Sept. 3, 1878	Collision	700
Ertogrud	Japan Coast	Sept. 19, 1890	Wreck	540
Utopia	Gibraltar	Mar. 17, 1891	Collision	574
Naronic	Atlantic	Feb. 1893	Unknown	
Elbe	North Sea	Jan. 30, 1895	Collision	335
Reina Regenta	Gibraltar	Mar. 11, 1895	Wreck	400
Burgoyne	Off Sable Island	July 4, 1898	Collision	871
Maine	Havana Harbor	Feb. 15, 1898	Explosion	260
General Slocum	New York	June 15, 1904	Fire	1000
Norge	Scotch Coast	June 28, 1904	Wreck	646
Mikasa	At Sea	Sept. 13, 1905	Explosion	599
Mutsu Maru	Japanese Coast	Mar. 23, 1908	Collision	300
Ying King	Near Hong Kong	July 28, 1908	Wreck	300
Waratah	Atlantic	Aug. 1909	Unknown	300
Titanic	Atlantic	Apr. 14, 1912	Iceberg	1595
Empress of Ireland	St. Lawrence River	May 29, 1914	Collision	1027
Bulwark	Thames River	Nov. 26, 1914	Explosion	800
Lusitania	Irish Coast	May 7, 1915	Torpedo	1446
Eastland	Chicago River	July 24, 1915	Capsized	900

SHIRAZ, *she rahz'*, PERSIA, capital of the province of Farsistan, situated on a plateau about 4,750 feet above the sea in the southwestern part of the country, 112 miles from the Persian Gulf. It is in the midst of a region noted for its rose gardens, vineyards, cypress groves and orchards. The city is surrounded by an old wall, and one hundred years ago it was the residence of the ruler and was the chief center of science and art for Persia. It was then celebrated for its magnificent buildings and its elegant manufactures. It has now lost much of its importance and has been seriously damaged by earthquakes. The manufactures include textiles, rose water, glass, silverware and inlaid work. Population, estimated, 50,000.

SHITTIM, *shit'tim*, WOOD, the wood of which the ark of the Covenant in the wilderness was principally constructed. It is the wood of the shittah tree of the Bible, which is supposed to be the *Acacia seyal* of the Sinaitic peninsula. It grows to a height of twenty feet and has stiff, thorny branches. Its wood is of a hard, orange-brown color, and is well adapted to furniture making. It is not an imposing tree.

SHODDY, a fiber made of shredded woolen, worsted or mixed rags. The rags are thoroughly cleansed, then shredded and carded, by processes similar to those used in the manufacture of wool (See WOOLEN MANUFACTURE). When it leaves the cards the fiber is in the form of long, fluffy rolls. These are packed into bales under hydraulic pressure, and in this form they are shipped to manufacturers.

This used material is not so strong as new fiber, and in the reweaving a certain amount of new material is used with it; sometimes this is wool, sometimes cotton. In the form of wool powder shoddy is also used to add weight and substance to certain inferior woolen cloths. The shoddy industry is important in the United States, England and Canada. Where no attempt is made to deceive the buying public, the production of shoddy is a service to those of limited means, for it can be made into attractive and serviceable garments.

SHOES. See **BOOTS AND SHOES.**

SHOGUN, *sho'gun*, meaning *great general*, was the name given to the military commander of each of the four districts into which the Japanese Empire in early times was divided. These commanders eventually became absolute rulers of their districts and superseded the mikado in power. After having been held successively by four military clans for almost 700 years, the office of shogun was abolished by the revolution of 1868 and the central power was reestablished.

SHOOTING STAR. See **METEOR.**

SHORT BALLOT. In large cities at a general election the ballot usually contains so many names that many voters become confused in marking them, and not infrequently they vote for a candidate for whom they did not intend to vote. Moreover, the large number of officials to be elected makes it practically impossible for the voter to become acquainted with the qualifications of all the candidates, and irresponsible men are frequently elected to office.

The *short ballot* is designed to do away with these evils by placing on the ballot only the names of those officials who are to determine public policy, leaving to appointment all those whose duties are merely administrative. It is further urged that very few offices be filled at one election. Questions of public policy are also presented to the voter for his approval. Public interest in this pro-

posed reform is shown by the rapid extension of the commission form of government among cities, for this plan necessarily includes the underlying principles of the short ballot. See **MUNICIPAL GOVERNMENT.**



SHORTHAND, the method of writing by which the process is so abbreviated as to keep pace with speech. It is also known, according to the principle underlying the particular system, as stenography (compressed writing) and phonography (sound writing). It was practiced by the ancient Greeks and Romans, not

only on account of its brevity, but for purposes of secrecy; but all knowledge of the art was lost from the tenth century until the end of the sixteenth, when modern shorthand had its birth in the publication by Dr. Timothy Bright of his *Characterie* and by Peter Bales of his *Arte of Brachygraphie*. In these early systems arbitrary signs were used in most cases to denote each word. The earliest system of shorthand of any practical importance was that of John Willis, whose *Arte of Stenographie* (1602) became very popular. It was based on the common alphabet, with the addition of arbitrary signs; and this, indeed, was the character of the numerous systems which obtained until the time of Pitman. Willis had many imitators, some of whom made slight improvements in his system, but William Mason, whose system was published in 1672, was the only one who made any real advance.

In 1751 Thomas Gurney published his *Brachygraphy*, founded on Mason's system, and the use of Gurney's system has been perpetuated by his descendants, who have been the official shorthand writers of the Houses of Parliament since the beginning of the nineteenth century. In 1767 appeared the *Universal English Shorthand* of John Byrom, an *a, b, c* system, characterized by "simple strokes and no arbitrary characters;" and in 1786 the *Stenography* of Samuel Taylor was published. This, which is the best of all the *a, b, c* systems, contributed largely to make stenography popular, and it was the system which was almost universally used until Isaac Pitman gave his *Phonography* to the world in 1837. Taylor's system possessed more easy

and natural outlines and was therefore capable of being written with a greater degree of speed than any previous system, and it contained no arbitrary characters. Harding, who re-edited the system in 1823, introduced a few.

Pitman had a number of predecessors, whose systems, like his own, were strictly phonetic. These systems, however, never obtained any footing, while Pitman's almost immediately became popular; the Benn Pitman system, a variation of the original Pitmanic, is now used by more reporters and shorthand writers than any other. Like all other phonetic systems, Pitman's rejects the ordinary orthography and writes words according to the sounds; thus *though* becomes *tho*, *plough* becomes *plow*, and *enough* becomes *enuf*. Discarding the common alphabet, which formed the basis of the stenographic systems, it has adopted an alphabet of its own, consisting of a series of straight lines, curves and dots, each representing a distinct sound. This alphabet is the basis of a highly ingenious and complex system, which aims at securing the greatest degree of brevity consistent with legibility. In rapid writing in Pitman's system the vowels are generally omitted.

In recent years several new systems have been introduced and have met with more or less success. Many of these are modifications of the original Pitmanic system, such as Graham's (1858) and Munson's (1867). There are also many constructed upon a new and so-called "rational" basis. Of these now widely used in the United States, the best-known are the Cross, or Eclectic, the Pernin, the Gregg and the McKee. All differ from each other as greatly as from the Pitmanic systems. The Cross, or Eclectic, is formed largely upon the basis of position of strokes, though several new strokes are also used. The Pernin is evolved from geometrical figures and does not use the Pitmanic shading. The Gregg system, which has been gaining adherents rapidly in the West, has five striking features—(1) no shading; (2) slope same as in long-hand; (3) no position writing; (4) vowels and consonants conjoined; (5) curves are used and few angles. The McKee, commonly known as the New Standard system, retains the Pitmanic shading, and its vowels are composed of circles and ellipses in different sizes. It does not use positions.

Shorthand has now been developed to the point where it easily keeps pace with speech,

a fair average for an accomplished reporter being from 150 to 175 words a minute. Speed records have been made and authenticated of from 200 to 275 words a minute, for a period of ten or fifteen minutes in succession, and higher rates have been reached for shorter periods.

SHOSHONE INDIANS, the great group of tribes who lived west of Kansas, north and west as far as Oregon and south and west to California. Those east of the Rocky Mountains were hunting tribes, of fierce and warlike disposition, while those living west of the mountains lived on small animals, fish, roots and seeds. The savagery of the Shoshoni, also called *Diggers*, or *Snake*, Indians, was thoroughly disgusting, but some of the southern members of the group, the Hopi in particular, living in Northwestern Arizona, were Pueblo Indians and were successful agriculturists and skilled makers of pottery and basketry. Bannock, Comanche, Ute and Shoshoni are among the principal tribes. The tribes belonging to this great family are bound together by kindred languages, more than by any physical resemblances or common customs of life.

Related Articles. Consult the following titles for additional information:

Comanche	Indians, American
Hopi	Ute

SHOSHONE FALLS, *sho sho'ne*, a waterfall of the Snake River, in Southern Idaho, exceeded in grandeur and majesty, in the United States, only by Niagara Falls and the falls of the Yosemite Valley. The river flows for some distance through a canyon 800 feet deep, where it has a number of small falls and cataracts. These terminate in the main fall, which plunges 190 feet into a lake at the bottom of a gorge over 1,000 feet deep.

SHOSHONE RIVER. See SNAKE RIVER.

SHOT, the name applied to small projectiles used in sporting weapons called *shot-guns*. It is made by pouring melted lead through holes in a collander placed at some distance above water. The drops of lead assume a globular form in their descent and harden when they strike the water. There are different sizes of shot, each adapted to the purpose for which it is intended. A small shot is used in hunting birds, but a large size is required for small animals. The sizes are designated by number.

Formerly the term *shot* was applied to all solid projectiles fired from cannon, but it is

not considered in that sense since the invention of the modern shell. See SHELL.

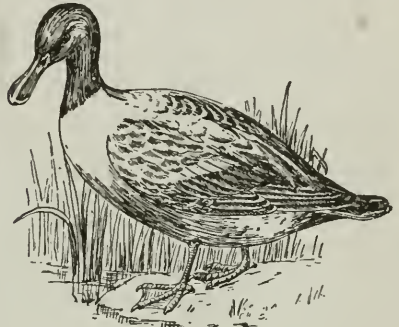
SHOT, PUTTING THE, an athletic test of strength and skill. The shot putter throws a weight the greatest distance possible without stepping outside of a seven-foot circle. The shot is spherical in shape. For the use of boys it weighs twelve pounds; for adults, sixteen pounds. In the first position the putter stands with his right heel just within the circle and his left foot forward. The put is held loosely in his right hand, which rests, palm upward, on his right shoulder, and the right elbow is held close to the body. The first movement is a leap forward by a quick turn to the right, which brings the weight of the body upon the right foot. The putter then swings his body forward, using his left foot as a pivot, throwing his right foot forward as far as he may, at the same time thrusting out his right arm and releasing the shot at an angle of forty-five degrees. Shot putting is not arm throwing, but, rather, delivering a weight by swinging the entire force of the body into the movement.

SHOTGUN, a smooth-bore gun which fires a charge of small shot, and which is used for shooting small game. Formerly shotguns were made with one, two or even three barrels, and the double-barrel gun is still in favor with many sportsmen. The typical modern shotgun has but one barrel, and a magazine in which the shells are stored. The bore of a shotgun is named from the weight of the bullet, required to fit it. If it takes a bullet weighing one-twelfth of a pound, it is a 12-bore. This and 10-bore are the sizes most commonly used. All modern shotguns are breechloaders, the cartridges or shells being inserted in the breech. The cartridge—a charge of explosive, a load of shot and a percussion cap, to explode the charge—is usually packed in a cylindrical paper casing. From six to twelve cartridges can be placed in a magazine. The effective range of a 12-bore shotgun is from sixty to seventy-five yards; for rabbits and partridges, forty to fifty yards.

The first breech-loading gun was invented in 1836, and since that time by numerous improvements shotguns have been brought to as high degree of perfection as any other small arm. Hammerless guns, which discharge the shell by a mechanism hidden in the breech, are the most popular. The prices of shotguns vary from \$10 for the cheapest to \$200.

SHOVELBOARD. See SHUFFLEBOARD.

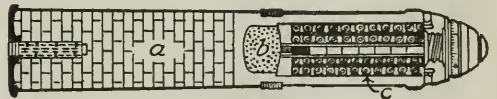
SHOVELER, *shuv'el er*, or **SPOONBILL**, a river duck, so named because the end of its bill is widened, like a shovel or spoon, its upper mandible overlapping the lower. It



SHOVELER

feeds in the mud of shallow waters, using its bill to stir up the mud and capture small animals. The male bird is rather gay in color, but the female is much more modest in appearance. One species is found in the United States during summer, although the shoveler is more prevalent in South America, South Africa and the Australian region.

SHRAPNEL, a projectile used extensively by field artillery and to some extent in navies. It consists of an elongated pointed steel shell filled with bullets and an explosive charge set to a time piece. The base of the shell is enclosed in a metal case which contains the explosive that fires the shell from the gun. There are a number of sizes of shrapnel, each determined by the caliber of the gun in which it is to be used. The 3-inch gun is in general use in light field artillery, and this carries a shell weighing about eighteen pounds. The length of the shell is three times its diameter



SHRAPNEL

- a. Smokeless powder (Nitrocellulose)
- b. Black powder
- c. Shot

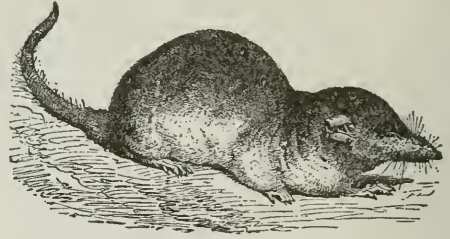
and it carries from 238 to 350 lead balls. The exploding charge may be placed in the front or the rear. A shell for 5-inch gun weighs forty-five pounds, and contains 22½ pounds of lead balls. These shells are effective at 11,000 yards, or about six miles. Those of the 3-inch gun are effective from three to four miles.

Shrapnel is designed for use in the field and to dislodge the enemy from covered places, and is very destructive. A single shell when it bursts throws its balls over an area of several hundred square feet. A battery of a few guns will soon render a large field untenable. In the navy shrapnel is used against torpedo boats and other small craft. It was named for its inventor, Colonel Henry Shrapnel of the British army.

SHREVEPORT, *shreev'port*, LA., the second city in size in the state and the parish seat of Caddo Parish, 325 miles northwest of New Orleans and fifteen miles from the Texas state line. The city is on the Red River and on the Texas & Pacific, the Missouri, Kansas & Texas, the Vicksburg, Shreveport & Pacific, the Houston East & West Texas, the Kansas City Southern, the Louisiana Railway & Navigation Company, the Louisiana & Arkansas, the Saint Louis & Southwestern (Cotton Belt) and the Texarkana, Natchitoches & Shreveport railroads. It is in the center of the northwestern part of the state. Cotton is the principal product of the rich agricultural region, and the city contains cotton compresses, cottonseed oil mills, machine shops, fertilizer works, ice factories, lumber and stockyards and manufactories of safes and vaults, silos and bottles. It also exports considerable live stock, hides and wool. Some of the prominent features are three hospitals, a Federal building, a courthouse, a fine city hall, a large hotel and a new bank building. Shreveport was settled in 1833 and was incorporated in 1839. During the Civil War it was the capital of the state, after the capture of Baton Rouge. The commission form of government was adopted in 1910. Population, 1910, 28,015; in 1917, 37,064 (Federal estimate).

SHREW, a genus of small insect-eating mammals, found in almost every region of the northern hemisphere. The *common shrew* may readily be distinguished by its prolonged muzzle, by its teeth, colored brown at the tips, and by its reddish-brown fur. It feeds chiefly by night upon insects and their larvae, and inhabits dry places making a nest of leaves and grasses. Shrews are voracious in their habits and frequently kill and devour one another. They secrete a fluid of disagreeable odor, which prevents larger animals from eating their flesh. In former days the bite of the shrew was accounted venomous, while its body, variously treated, was regarded

as a cure for many complaints. One American species, the *mole shrew*, resembling a mole in some of its habits, feeds upon flesh of all kinds. Another American species is the *shrew mouse*, smaller and lighter in color, which dwells around marshes and wet regions.

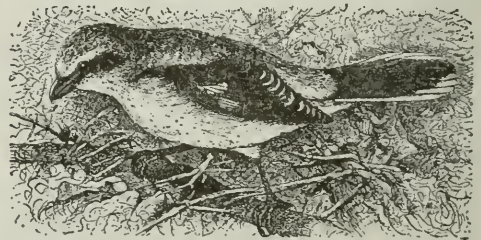


COMMON SHREW

The *water shrew*, the largest American shrew, attains a total length of about five inches. The snout is not so pointed as that of the common shrew. Its color is black on the upper parts and white underneath. A prominent swimming fringe of stiff, white hairs is found on the tail and the toes, which forms a distinctive feature of the species. Its food resembles that of the common shrew. It makes its burrows in the overhanging banks of rivers and lakes and dives and swims with great facility.

SHREW MOLE, a genus of mammals belonging to the family of shrew mice, but also by some zoölogists placed in the mole family. It is found in North America, usually near rivers and streams, and burrows after the fashion of the common mole, which it resembles in its fine and closely-set fur. The average length of the shrew mole is about seven inches.

SHRIKE, a name applied rather loosely to various birds with strong, hooked bills. In the United States but two species are



SHRIKE

found—the *northern shrike*, or *butcher bird*, and the *loggerhead shrike*. These birds strongly resemble each other in appearance

and differ but little in size. Their general color is gray on the upper and white on the under parts, the quills of the tail are black, and a black band crosses the forehead and surrounds the eyes. Shrikes are about nine or ten inches in length. They prey on large insects and small mammals, impaling them upon thorns, fence barbs, or forked twigs.

SHRIMP, a genus of small crustaceans, closely allied to the crawfish. The *common shrimp*, found in the North Atlantic on both



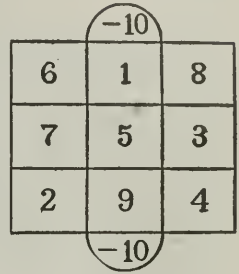
SHRIMP

the European and American coasts, and in the Pacific, is about two inches long, greenish-gray in color, with brown dots; on the Pacific coast it is pink. Shrimps are caught in nets and are marketed in canned form.

SHROVE TUESDAY, in Roman Catholic ritual, the day before the first day of Lent, or Ash Wednesday, so called because confession is specially made and "shrift" is received. It was at first a day of considerable festivity, and from the common practice in England of eating pancakes then, the day came to be called *Pancake Tuesday*. It is the *Carnival* of the Italians. Since 1857 Shrove Tuesday has been celebrated in New Orleans by a street pageant, known as the *Mardi Gras* representing, in elaborate tableaux, noted scenes in history and literature, by a masquerade ball and by other gay entertainments.

SHUFFLEBOARD or **SHOVELBOARD**, a game played by two or four persons, on a sand-sprinkled board, thirty feet long, with raised edges. Across the board, five inches from each end, a line is drawn. Eight circular pieces of iron, about two and a half inches in diameter and weighing a pound, are used by the players, who slide them the length of the board. Each side has four pieces, and the players slide them in rotation. If a piece is left projecting over the edge of the board, it scores three points. If it rests between the finishing line and the edge or on the line it scores two points. If no piece is inside the line, then the one nearest to it scores one. The game is twenty-one points.

Another form of shuffleboard is popular on ocean steamers. A place on the deck is marked out, as in the accompanying diagram. The players stand nine or ten paces away, and each in turn pushes one of his pieces along the deck



SHUFFLEBOARD

with a crutch-shaped cue, in an endeavor to leave the pieces on the numbered squares. If a piece rests on one of the semi-circular places, ten is taken off the player's score; on the squares the count is as indicated by the numbers. The game is exactly 50 points. If more than fifty are made, the additional ones are deducted from the score.



A Siamese prince

SIAM, the "Kingdom of the Free" and the "Land of the White Elephant," is the only independent country in Indo-China Peninsula. A projection extends into the Malay Peninsula, reaching south to the 4th degree of north latitude, and is known as Lower Siam. Siam proper is bounded on the north and east by Anam, or French Indo-China, on the south by the Gulf of Siam and on the west by Burma. Lower Siam separates the Indian Ocean on the west from

the China Sea on the east. The northern boundary is somewhat indefinite, but the area of the country is about 195,000 square miles, or about the area of California and Indiana combined. About 45,000 square miles are in the Malay Peninsula.

The People. In 1916 there were 8,819,686 people in the country. Of this number 1,500,000 were Siamese, who are indolent, carefree, submissive and hospitable. They are of Mongolian stock, of medium height, and have an olive complexion, somewhat fairer than that of the Malay. Many Laotians dwell in the northern part of the kingdom, and Shan, Karen and Kamoo tribes are found in the uplands. The country contains a large number of Chinese, who control all the im-

portant business enterprises. It is estimated that one-third of the population of Bangkok is Chinese.

Buddhism is the principal religion, and the white elephant, which is native in the peninsula, is an object of veneration and even worship, because it is believed that the soul of some great king or of Buddha himself is embodied in the animal. Buddhism is found in Siam in its purest form, and the king is recognized as the protector of the faith. Class distinctions, such as are found in India, do not exist.

All public schools are under control of the Minister of Public Instruction and Ecclesiastical Affairs. There is a commissioner of education in each province. Besides government schools there are local and private schools, and in addition to the activities of the government in behalf of education, the institutions established by American, English and French missionaries provide educational facilities for a large number of children. A number of secondary schools have been established, and a university with departments of medicine, law, engineering, agriculture, commerce and pedagogy has been organized. The Siamese language is the official language of the kingdom.

Surface and Drainage. In general, Siam proper is a low plain, sloping gently toward the south and consisting of the valleys of the Menam River and its tributaries, together with the Mekong, which forms the western boundary, and the valleys of its tributaries. The watersheds between these are low and in some places scarcely noticeable. In the main, the land along the streams and near the coast is low and swampy. On the southeastern border is Tonle Sap Lake, a large part of which is in Cambodia. On the western boundary is a rocky ridge, constituting a low mountain chain, the extension of which forms the backbone of the Malay Peninsula. The Mekong, forming a part of the eastern boundary; the Menam with its tributary, the Meping, and the Nam Mun are the principal rivers.

Climate. The climate is tropical, but owing to the position of the country in reference to the sea, it is not as hot as one might expect from the latitude. The humidity is great, and in general the climate is trying, if not unhealthy, to Europeans. There are two seasons, the wet and the dry, the former lasting from May to October, and the latter occupying the remainder of the year. The rain-

fall is heavy, in some sections amounting to 240 inches a year, but during the dry season, in the northern part of the country, no rain falls for several months. Here the atmosphere is drier, and the nights are cool.

Production and Industry. The northern part of the country is covered with dense forests, containing teak and other tropical woods, and large quantities of teak are exported, but the great wealth of the country lies in its agricultural regions, which are confined to the lowlands of the southern half. By means of the numerous rivers and canals, these can be amply watered and even flooded when necessary. The chief crop is rice, and Siam is one of the largest producers of this grain in the world. Cotton, tobacco, sugar cane, coffee and pepper are also raised. The mineral resources are not developed, yet mining is carried on to a considerable extent. The mining operations include tin, gold and tungsten. Coal, iron, zinc, manganese and antimony occur in large quantities.

Transportation and Commerce. The rivers constitute the chief avenues of commerce. There are over 1,200 miles of railway in operation. The telegraph and the telephone have also been introduced. The chief export is rice, and the annual shipments vary in value from \$15,000,000 to \$20,000,000. Other important articles of export are teak and precious stones. The timber cutting is under the care of English experts, who have supervision of the forests.

Government. The government is an absolute monarchy. The king is assisted by a ministry, consisting of members appointed by himself, who have charge of the various departments of government. In addition to these there is a legislative council which includes the ministry, ex-ministers and others who are nominated by the king. Within recent years the government has made marked advance along lines similar to those followed by the best European nations. This is largely due to the advice of foreigners, especially Englishmen, whom the king has called to his assistance. For the purpose of local government the country is divided into provinces, over each of which is a governor. Much of the territory subject to the king is nominally under the control of France or Great Britain, and other portions are ruled by the chiefs of native tribes, though these are subject to the central government at Bangkok. The Malay provinces are ruled by rajahs, who

are subject to a local agent, who represents the king. Bangkok is the capital and the only city of importance. Consult Knox's *Siam and Java* and Annie H. Leonowen's *Siam and the Siamese*.



Villager in winter costume.

SIBERIA, *sib'eria*, formerly a division of the Russian Empire, constituting the most extensive portion of the Russian domain in Asia. In 1917, when the czar was overthrown, a provisional government was set up in Siberia independent of the one in Petrograd, and later, on the seizure of power by the Bolsheviks, an anti-Bolshevik government was established at Omsk, in Western Siberia. (For details, see subhead *History*, below.)

Physical Features. Siberia extends across the continent of Asia, from the Ural Mountains on the west to the Pacific Ocean on the east, and from China on the south to the Arctic Ocean on the north. The southern boundary is distinctly marked along the western portion by the Thian-Shan Mountains; by the Altai, in the center, and by the Yablonoi, farther east, while the extreme eastern portion of this boundary is formed by the Amur River. The area is about 4,800,000 square miles, or one and one-half times that of the United States, exclusive of Alaska and island possessions.

The entire region is a vast plain, sloping gradually to the north, but it is naturally divided into western and eastern portions, the western part containing scarcely any elevations, the watershed between the Obi and the Yenesei being so slight that it is scarcely perceptible. The Stanovoi Mountains extend along the eastern coast and rise abruptly from the sea. A spur of this range, extending into the peninsula of Kamchatka, has some peaks that are estimated to have an elevation of nearly 15,000 feet. Between the Stanovoi Mountains and the Lena River are a number of broad elevations, more resembling plateaus than mountain ranges, so that this portion of Siberia has a somewhat mountainous character. The highest peaks are found along the southern border, where the White Mountain, in the great Altai, near the southeastern

boundary, reaches an elevation of 14,800 feet, and other elevations along the ridges forming this boundary, range from 9,000 to 12,000 feet.

Siberia has a number of long rivers. In their order, from the west eastward, these are the Obi, the Yenesei and the Lena, flowing into the Arctic, and the Amur, flowing into the Pacific. It is estimated that no other country, except Brazil, has so many long rivers as Siberia. The Amur is navigable for about 2,400 miles; but the rivers flowing into the Arctic are of little value commercially, because they are closed by ice during the greater portion of the year. However, steamers ascend these and their tributaries during the summer months and afford the inhabitants of their valleys opportunity to communicate with the outside world.

Climate. The climate of Siberia is characterized by short, warm summers and long and intensely severe winters. Central Siberia is considered to have a colder climate than any other habitable portion of the globe, the thermometer in winter sometimes registering 60° and even 75° below zero. In the northeastern part of the country, the soil remains frozen throughout the year, with the exception of a few inches near the surface, that thaw during the summer. It is supposed to be frozen for several hundred feet below the surface. In excavations that have been made, layers of ice intervening between layers of soil have been found to considerable depths, and geologists are of the opinion that these ice sheets are remains of the glacial age. In the eastern part of the country there is very little rain or snow, and over a good part of the region, it is impossible to use sledges; but in the western portion there is rainfall sufficient for successful agriculture.

Resources and Industry. According to its vegetable life, Siberia can be divided into three regions. The great tundra, occupying the northern portion of the country, has its surface covered with mosses and lichens, except during the short summer, when numerous flowering plants spring up and come to rapid maturity. South of this, occupying the central portion, is the wooded belt, which extends the entire length of the country and contains trees of stunted growth. This gradually merges into the woodland and forest belt, which extends across the entire southern part. This region is believed to contain the most extensive forests known, aside from those of

the Amazon basin. Here are found large areas of pine, spruce, maple, oak, beech, birch and poplar. The summers in this part of Siberia are sufficiently long to admit of the growing of nearly all crops raised in cool temperate regions. Siberia abounds in fur-bearing animals, and the taking and curing of furs is a valuable industry for the inhabitants of some of the colder regions.

The mineral wealth is largely undeveloped. Mining operations are carried on in the Ural Mountains, where gold, silver and platinum are found. Gold mines are also worked to some extent in the eastern and northeastern parts of Siberia, and coal mining has received some attention. There are extensive deposits of salt, sulphur, lead and copper awaiting development.

Agriculture is the chief occupation of the inhabitants, and this is most extensive in western Siberia, where large crops of wheat, hay, oats, barley and potatoes are raised. The raising of live stock is also important. The most important manufacturing center is Tomsk, which contains a number of mills and factories and supplies a large region with porcelain, flour, carpets, iron ware and refined sugar.

Transportation. The Trans-Siberian Railroad, extending the entire length of Siberia and connecting Vladivostok, on the Pacific, with Moscow and Petrograd, has been an important factor in the development of the country. By means of this line of transportation, goods from other lands can be imported, and the products of the inhabitants can reach foreign markets at rates of transportation that enable them to be sold with a margin of profit. Because of unsettled conditions this railroad declined considerably in efficiency after the Russian revolution, but steps were taken in the spring of 1919 to rehabilitate it. In March allied control of the road was effected by the formal organization of technical and military committees. The head of the technical committee was John F. Stevens, an American railway expert.

People. Western Siberia is much more densely populated than the other portions of the country. Over sixty per cent of the population are Russians. The other inhabitants include, chiefly, Germans and Aryan gypsies, while in the eastern portion are a number of tribes closely allied to the Samoyeds and Finns. In Eastern Siberia are Tartars, Chinese, Manchus and Koreans. In 1915 the

population was estimated at 10,377,900.

Cities. Under the old régime, Omsk (population 135,800) was the seat of government of the Steppes provinces, but it is geographically in Siberia. Irkutsk (129,700) was the capital of Eastern Siberia; Tomsk (116,664), the capital of Western Siberia. The largest Pacific port, Vladivostok (91,464), was the chief Russian naval station in Asia.

History. Western Siberia was taken by the Russians in 1582, and from that time the purpose of the Russian government was to extend its dominions eastward. It was a long time before the Pacific coast was reached, and the last acquisition of territory, which was obtained from China, was not made until 1861. Following the Chino-Japanese War, in 1896, Russia secured a lease of Port Arthur and other portions of Manchuria, but its failure to keep the treaty agreement to vacate certain ports after 1900 led to the war with Japan in 1904, as a result of which Russian aggressions in the East were checked, and Port Arthur, a part of the island of Sakhalin and some other territory were relinquished.

Under the rule of the czars thousands of political offenders were sent to Siberia, and the name became synonymous with cruelty and despotism. There is no doubt that great injustice characterized the system, and many of the exiles who returned to Russia in 1917 on the downfall of the imperial government, had strongest personal reasons for throwing themselves into the revolutionary movement. The people of Siberia attempted to establish an independent republic at that time, and the Siberian district congress at Tomsk elected a provisional government with a coalition Cabinet.

The overthrow of the Kerensky régime by the Lenine group in November, 1917, gave impetus to Bolshevik sentiment in Siberia, and from that time on there was great political confusion. The situation was affected by several factors, including the march of the Czecho-Slovaks through Siberia and the landing of allied troops to keep the country from falling into anarchy. The Czecho-Slovaks, men of Bohemia and Slovakia, were deserters from the Austrian army. Several thousand had joined the Russians, and when Russia withdrew from the war they were given permission by Lenine to go to France by way of Siberia. While on the march they were attacked by Bolsheviks, and, according to re-

ports, by liberated German and Austrian prisoners. In self-defense they struck back, seized the Trans-Siberian Railway, and were persuaded by the allies to remain in Siberia to help preserve order.

Omsk became the headquarters of the anti-Bolshevik government, and in the fall of 1918 there was established in that city a directorate of the All-Russian Government, representing a coalition of numerous political and social parties. In November Admiral Kolchak, head of the anti-Bolshevik troops in Siberia, was made leader of the government. In the meantime the allies had intervened by sending troops into the country, with the understanding that they were to work under the leadership of Japan, and that each country was to land not more than 7,000 men. The object of intervention was to preserve order and aid in the economic development of the country. The American contingent was commanded by Major-General S. Graves, and the first disembarkation, at Vladivostok, occurred on August 15, 1918. Much criticism was directed against the United States government because of its supposed "do nothing" policy. President Wilson publicly declared that America would not intervene in the domestic affairs of the Russians, and the American officials scrupulously followed this policy, so far as it was possible.

America did take steps, however, to prevent the exploitation of Siberia by Japan. Because of representations made by the State Department Japan withdrew over half its troops from the country, as the Japanese government had sent about ten times as many soldiers as had been agreed upon. America also succeeded in bringing about an inter-allied agreement for the reorganization and operation of the Trans-Siberian Railway, a move which had long been hindered by the Japanese war faction. By March, 1919, American troops had begun to take control of strategic points on the railway between Vladivostok and Tchita, and the system was being reorganized.

The political and military situation was somewhat uncertain in the summer of 1919. For a time Admiral Kolchak had considerable success against the Russian Bolsheviks in the region of the Ural Mountains, and he expected to combine his forces with the Cossacks and the troops at Archangel, eventually bringing all Russia under his control. In June he was reported to be retreating and to have suffered serious reverses. Negotia-

tions with the allies were at that time begun for official recognition of the Omsk government.

Related Articles. Consult the following titles for additional information:

	CITIES
Irkutsk	Tobolsk
Omsk	Vladivostok
	LAKES
Aral	Baikal
	MOUNTAINS
Altai	Ural
Stanovoi	Yablonoi
	RIVERS
Amur	Obi
Lena	Yenesei
	UNCLASSIFIED
Russia	World War
Trans-Siberian Rail- way	

SIBYL, *sib'ul*, according to Greek and Roman mythology, a group of women said to have been endowed by Apollo with prophetic spirit. Their number is generally given as ten, of whom the most celebrated was the *Cumaean sibyl* (from Cumae, in Campania). She was said to have written the collection of prophecies known as *Sibylline Books*, which she offered to Tarquin the Proud for sale. When he refused to buy them, on account of their excessive price, she threw three of the nine books into the fire. On a second refusal, she destroyed three more, after which Tarquin, in alarm, paid for the three remaining volumes the price originally asked for the nine. These books were preserved in the Temple of Jupiter Capitolinus, and were consulted on occasions of national danger. When, in 83 B. C., they were burned in a fire which destroyed the temple, the Senate sent delegates to Italian and Greek cities to collect all Sibylline verses they could find. About 1,000 were retained and preserved in the new Temple of Jupiter Capitolinus. These were burned by Stilicho shortly after A. D. 400. The so-called Sibylline oracles which have come down to modern times are of Jewish or Christian origin, dating from about 170 B. C. to A. D. 700.

SICILIAN, *sis sil'e an*, **VES'PERS**, the name given to the massacre of the French in Sicily on Easter Monday, 1282, while the bells were ringing for the vesper service. Charles of Anjou had established himself, through the favor of the Pope, in possession of Naples and Sicily. He ruled with great severity, and the oppressed people applied in vain to the Pope for relief. Enraged by the insult offered a young bride by a French soldier, the inhabitants of Palermo flew to

arms and massacred the French. Messina and other towns followed the example of Palermo, and the Sicilian Vespers ended in the overthrow of the domination of Charles of Anjou.

SICILIES, *sis'il liz*, KINGDOM OF THE TWO, a former kingdom of Italy, consisting of Naples, or southern Italy, and Sicily (see SICILY). About 1037, while Greeks and Saracens were struggling for the possession of Lower Italy and Sicily, the sons of Tancred de Hauteville, a count in Lower Normandy, entered Lower Italy with their followers. Robert Guiscard, one of these brothers, subdued Apulia and Calabria, taking the title of duke, and his youngest brother, Count Roger, conquered Sicily. Roger's son and successor, Roger II, completed the conquest of all Lower Italy by subduing Capua, Amalfi and Naples, and in 1130 he took the title of king, calling his kingdom the Kingdom of the Two Sicilies.

In 1189 the race of Tancred became extinct, and the German emperor, Henry VI, of the House of Hohenstaufen, claimed the kingdom in the right of his wife, the daughter of Roger II. The kingdom remained with the family of Hohenstaufen until 1266, when Pope Urban IV, feudal overlord, bestowed it upon Charles of Anjou, brother of Louis IX of France.

In 1282, Sicily freed herself from the oppressions of the French (see SICILIAN VESPERERS) by the aid of King Pedro of Aragon, and Naples was separated from it, Sicily being subject to the kings of Aragon. Naples remained under the rule of the House of Anjou. Alfonso V of Aragon gained possession of Naples in 1442, which he bestowed on his natural son, Ferdinand.

In 1504 Sicily was united to Naples under the Spanish crown, but in 1713 the Peace of Utrecht again divided the Two Sicilies, Naples falling to Austria, Sicily to Savoy. Philip V of Spain reconquered Sicily, but was forced to cede it to Austria in 1720, Savoy receiving Sardinia in exchange, by which means the Two Sicilies became a part of the Austrian dominions.

In 1734 Don Carlos, son of Philip V, invaded Naples, conquered both the continental and the insular part of the kingdom and was crowned at Palermo in 1735 as Charles IV. This change was sanctioned by the Treaty of Vienna (1738), and till 1860 this line of the Bourbon family maintained possession of the Two Sicilies, except for a few years during the Napoleonic period, when Joseph Bona-

parte and Joachim Murat reigned on the mainland as kings of Naples.

Francis I, Ferdinand II, and Francis II were despotic tyrants, who forced the people into periodic revolts, which were put down with much severity. In 1860, however, an insurrection broke out in Sicily, and an expedition of volunteers from Piedmont and other Italian provinces, under Garibaldi, sailed from Genoa to the assistance of the insurgents. The result was that the Neapolitan troops were driven from the island. Garibaldi, following up his success, crossed over to the mainland, where he met little or no opposition. Francis II fled from Naples; the strong places in his hands were reduced, and by a popular vote the Kingdom of the Two Sicilies ceased to exist as such, and became a part of the kingdom of Italy. See ITALY, subhead *History*.

SICILY, *sis'il i*, a mountainous island, the largest in the Mediterranean, belonging to Italy, from the southwestern extremity of which it is separated by the narrow Strait of Messina. It has an area of about 9,935 square miles. The north and east coasts are steep and cliffy and are provided with good harbors, the finest being that of Palermo. The greater part of the surface consists of a plateau of varying elevation, and the highest point is the active volcano of Etna, in the eastern part of the island.

Climate. The climate, as in the other regions of the Mediterranean, is mild and agreeable, except when the island is visited by the sirocco. The soil is very fertile.

Industries and Manufactures. Three-fourths of the cultivated surface is given over to cereals, chiefly wheat, although oats and barley are also grown. Cotton, sugar and tobacco are also cultivated to some extent. Fruits of every variety grow in abundance. The vine flourishes almost everywhere, and much wine is produced. The chief exports are fruits, wine, sulphur, olive oil and sumach. Tunny and sardine fisheries are carried on along the coast. Manufactures are but little developed. The chief seats of foreign commerce are the three principal towns, Palermo, Messina and Catania. The system of roads and railways is defective. Education is extremely backward. Life and property are by no means secure, and brigandage still exists.

History. At the dawn of history, the older races inhabiting Sicily, the Sicani and the Siculi, were hemmed in by Phoenician and

Greek colonies. The Greeks, who entered the island in the eighth century B. C., founded the great cities of Syracuse, Agrigento and Messina. They drove the Phoenicians to the northwest coast and spread their influence and culture over the whole island. Greek art and literature flourished, and many Greek names of distinction are connected with Sicily. The Carthaginians later took the place of their kinsmen, the Phoenicians, and between them and the Greeks a struggle ensued, which ended in favor of the latter (480 B. C.).

War with the Carthaginians brought the Romans to Sicily, and the island became a Roman province in 212 B. C. On the decline of the Roman Empire, the island was overrun by the Goths, who retained possession till the sixth century A. D., when Sicily became part of the Byzantine Empire. In the beginning of the ninth century, the Saracens gained control and continued their supremacy until their expulsion in the eleventh century by the Normans, who remained long enough in possession to establish the feudal system in all its rigor. (For a continuation of the history of Sicily, see SICILIES, KINGDOM OF THE TWO.) Population, 1911, 3,672,258.

SICKLE, a reaping hook, consisting of a curved blade of steel with a handle, the edge of the blade being in the hollow of the curve. In using the sickle, the workman holds the handle in the right hand and grasps with the left hand as much grain as can be cut at one stroke. The sickle is then placed around this bunch of grass, just below where it is held, and is drawn backward towards the handle. The sickle has been largely superseded by the cradle, and the cradle in turn has given place to reaping machines. See SCYTHE.

SIDDONS, *sid'unz*, SARAH KEMBLE (1755-1831), the most celebrated English actress of her time, the daughter of Roger Kemble. She was born at Brecon, Wales. After her first success at Cheltenham, in *Venice Preserved*, in 1774, she secured an engagement at Drury Lane Theater, London, which was almost a failure, and again went on a circuit in the provinces. On her second appearance at Drury Lane, in 1782, as Isabella in *The Fatal Marriage*, she was acknowledged to be the foremost tragic actress of the English stage, and this distinction she retained until her retirement in 1818. She captivated audiences as Queen Catherine in *Henry VIII*, Lady Macbeth, Volumnia in *Coriolanus*, and many other parts. Sir Joshua Reynolds

painted a celebrated picture of her as the "Tragic Muse."

SIDEREAL, *si dé're al*, **TIME**, time measured by the apparent motion of the stars. A *sidereal day* is the time from the passage of a star across the meridian till its next passage; it is exactly the period of the revolution of the earth on its axis. It is the most constant unit of time. Its length is 23 hours, 56 minutes, 4.098 seconds. A *sidereal year* is the period in which the fixed stars apparently complete a revolution and come to the same point in the heavens; it is the exact period of the revolution of the earth around the sun. There are 366.2563612 sidereal days in a sidereal year.

SIDNEY, PHILIP, Sir (1554-1586), an English soldier, courtier and poet, one of the most conspicuous figures at the court of Queen Elizabeth. After graduating at Oxford, he traveled through Europe, and on his return he was most cordially received by Queen Elizabeth. During an absence from court, forced upon him by his outspoken opposition to a projected marriage of the queen, he wrote his famous romance of *Arcadia*. It is said that at one time, when, with Sir Francis Drake, he planned to set out on an expedition to the West Indies, Elizabeth commanded him to remain in England, saying that she could not lose the "jewel of her kingdom." Sidney had a part in England's attempt to defend the Dutch against the Spaniards, and at the Battle of Zutphen he was mortally wounded. While he was being carried from the battlefield, he called for water, but when it was brought to him, he motioned it away and said to a wounded soldier whom he saw regarding him wistfully, "Thy need is greater than mine." Sidney's death was deeply mourned throughout England. Though his writings have much merit, it is chiefly as a perfect type of the English gentleman that he is remembered.

SIDON, *s'idun*, one of the leading cities of ancient Phoenicia, situated on the Mediterranean, twenty-five miles south of Beirut. At various times it alternated with Tyre in supremacy in the Phoenician confederacy.

Sidon was famed for its purple dyes. Its people were skilled traders and artisans. Pliny credits them with the discovery and manufacture of a glass from the fine sand of the Belus River. A number of magnificent sarcophagi have been found in the vicinity of Sidon. The modern town of Saida, with a

population of about 12,000, occupies a portion of the site of the ancient city. See PHOENICIA; TYRE.

SIEGE, *seej*, in war, the stationing of an army before a fortified place for the purpose of forcing its surrender. In conducting a siege the enemy is first surrounded and cut off from supplies, reinforcements and retreat. The attacking party intrenches itself completely around and outside the land works of the defender and patrols the water front, if the fortification is situated on the water. A prolonged siege may starve the defender into submission, but the possibility of a relieving force causes the siege in many cases to end in an assault. Tunneling under walls and blowing them up with mines, bombardment by artillery fire, every engineering device known, may be applied in the conduct of a siege. In the latest warfare, bombardment along an extended line is a more common form of siege than the surrounding of a fort.

There have been many famous sieges in history, marked by heroic resistance of garrisons and inspiring bravery of assailants. Such are the fourteen months' siege of La Rochelle by Cardinal Richelieu in 1628; the four years' siege of the rock of Gibraltar by the French and Spanish during the years 1779-1783, and the siege of Port Arthur by the Japanese in 1904. In the World War there were sieges at Namur, Maubeuge, Novo Georgievsk and Przemyśl, while the campaigns on the various fronts, in which the armies of both sides intrenched themselves for months at a time, took on many of the characteristics of gigantic, prolonged sieges. See BOMBARDMENT; FORTIFICATION.

SIENKIEWICZ, *shen kya'vich*, HENRYK (1846-1916), a Polish author of a number of historical novels of tense dramatic interest, notably *Quo Vadis*, which has been given repeated stage as well as film rendition. He was born in the province of Siedlce, and was educated at the University of Warsaw. His first publication was a humorous story, *Nobody is a Prophet in His Own Country*. He wrote descriptions of a visit to California, a drama, and a number of short stories before the publication, in 1880, of a novel, *The Tatar Bondage*. The powerful historical trilogy, *With Fire and Sword*, *The Deluge* and *Pan Michael*, paved the way for his greater success, *Quo Vadis*, published in 1895. Notable among his other novels are *Without Dogma*, *The Children of the Soil*, *Knights of*

the Cross and *In Desert and Woodland*. In 1905 he was awarded the Nobel prize for literature. The translation of his works have given him an extended, appreciative audience in all countries. Sienkiewicz died in Switzerland while on a relief mission in behalf of his country, rendered prostrate in the World War.

SIER'RA LEONE, *la ohn'*, a British colony and protectorate on the west coast of Africa. The colony embraces a narrow coastal strip varying in width from eight to twenty miles and extending from French Guinea, on the north, to the Mano River on the south. It was founded in 1791 by a group of English philanthropists as a refuge for negro slaves. It has a population of about 75,000. The Sierra Leone Protectorate, embracing an area of about 30,000 square miles, lies to the east of the colony. It has a population of 1,403,000, consisting chiefly of negro tribes.

Near the coast the surface is flat and rocky; in the interior it is hilly, some elevations attaining a height of from 2,000 to 3,000 feet. The country is watered by a number of streams, flowing to the Atlantic. The climate is exceedingly hot and unhealthful, especially along the coast. The soil is fertile, the rainfall heavy, and abundant crops of rice, corn, plantains, yams, cassava and pumpkins are raised. Sugar cane, coffee, ginger, indigo and cotton can also be grown with profit. Tropical fruits are native, and bananas, pineapples, oranges and pomegranates are found in abundance. Some parts of the colony are covered with dense forests containing teak, ebony and rosewood. The chief exports include pepper, oil seed, palm oil, kolanuts, rubber, cocoa, ginger, hides, ivory, rice and beeswax.

The territory is administered by a governor. The capital, Freetown, has a population of 37,700, of whom only 500 are Europeans.

SIER'RA MADRE, *mah'dray*, the name of two mountain ranges of Mexico, which run almost parallel with the coast on either side, enclosing the central plateau of Anahuac. Following the curves of the coast, the ranges come closer together as they extend farther southward, and a little south of Mexico City they are practically connected by a range of volcanoes. The western range, *Sierra Madre Occidental*, averages over 8,000 feet in height, and has peaks more than 10,000 feet high; the eastern range, *Sierra Madre Oriental*, is considerably lower. Orchards of olives,

chestnuts and oranges grow at the bases of the mountains.

SIERRA NEVADA, *ne vah'da*, a mountain range of Spain, extending for about sixty miles in a northeast-southwest direction, near the southeastern border of the country. The range is about twenty-five miles from the Mediterranean coast and rises very abruptly. The Sierra Nevadas are the highest mountains in the Spanish peninsula, and the highest peak is the Mulhacen, 11,420 feet. The summits of the range are covered with snow during the greater part of the year, and it is from this fact that they obtain their name, which means *snowy range*. The lower elevations and the valleys between the mountains are fertile and are covered with orchards of olives, chestnuts and oranges.

SIERRA NEVADAS, a mountain range in California, extending north and south along the eastern boundary of the state, from Tehachapi Pass, on the south, to the southern part of Oregon. By some geographers the Sierra Nevadas are considered to belong to the same range as the Cascade Mountains, which extend northward through Oregon and Washington.

The Sierra Nevadas form an almost unbroken range, with an average width of seventy miles; and they contain numerous lofty peaks, reaching altitudes of from 10,000 to nearly 15,000 feet. The most prominent of these peaks are Mount Whitney, 14,980 feet, the loftiest summit in the United States, outside of Alaska; Fisherman Peak, 14,448 feet; Mount Corcoran, 14,093 feet, and Kaweah Peak, 14,000 feet. There are several other peaks that exceed 13,000 feet. The Sierra Nevadas contain many deep, narrow valleys, with nearly vertical walls, in some instances thousands of feet in height. Of these, Yosemite Valley is a good example. These valleys, combined with the lofty peaks, make the scenery of the Sierra Nevadas noted for grandeur. There are several passes traversing the range. The best known of these are the Truckee Pass, through which the Southern Pacific Railway reaches the Sacramento Valley; the San Joaquin Pass, in the center of the range, and the Tehachapi Pass, in the south.

SIGEL, *se'gel*, FRANZ (1824-1902), an American general, born in Baden, Germany. He was a veteran soldier of the German revolution of 1848; went to England in 1851, and emigrated to America the following year.

From 1853 until the outbreak of the Civil War, he was a teacher and journalist. In 1861 he entered the Federal army and organized a regiment of infantry and a battery of artillery. He fought with distinguished valor at Pea Ridge, Bull Run, in the Shenandoah Valley and at Maryland Heights. After his victory at Pea Ridge he was made a major-general. From 1865, when he resigned from the army, until his death, he filled various public offices in New York City and devoted much of his time to writing.

SIGISMUND, *si'jis mund*, (about 1368-1437) Holy Roman Emperor from 1411 to 1437, and king of Bohemia in 1419. On the death of his father-in-law, the king of Poland and Hungary, he was crowned king of Hungary (1387). Subsequently he became involved in war with Turkey, and after a defeat by Bajazet I, at Nicopolis, in 1396, he fled to Greece. On his return to Hungary in 1401, he was made prisoner, and the throne was given to a rival. Sigismund escaped, raised a powerful force and reduced Hungary to subjection. As Holy Roman Emperor he convened the Council of Constance, which put an end to the Hussite controversy; for his desertion of John Huss, whom he had promised to protect, he was bitterly censured. Sigismund was not recognized as king of Bohemia until 1436.

SIGNAL CORPS. In the World War troops on battle fronts more than 250 miles in extent were moved as a unit, and those not acquainted with modern methods of directing military operations wondered how this could be done. These extensive operations were made possible because of the efficiency of the signal corps, which has been called the "eyes and nerves" of the service. The signal corps is that branch of the army whose duty it is to gather and transmit information. The United States is the only nation that maintains a signal corps as a separate branch of the army. In other countries the duties of the signal corps are combined with those of some other branch of the service, usually the engineer corps.

The members of the signal corps are trained until they become experts in every known means of communication by day or night, from the light of a match that can be seen only for a few yards to the flashes of the heliograph, hundreds of miles away. The implements used are the telegraph, telephone, wireless, flags, lights, the heliograph, the

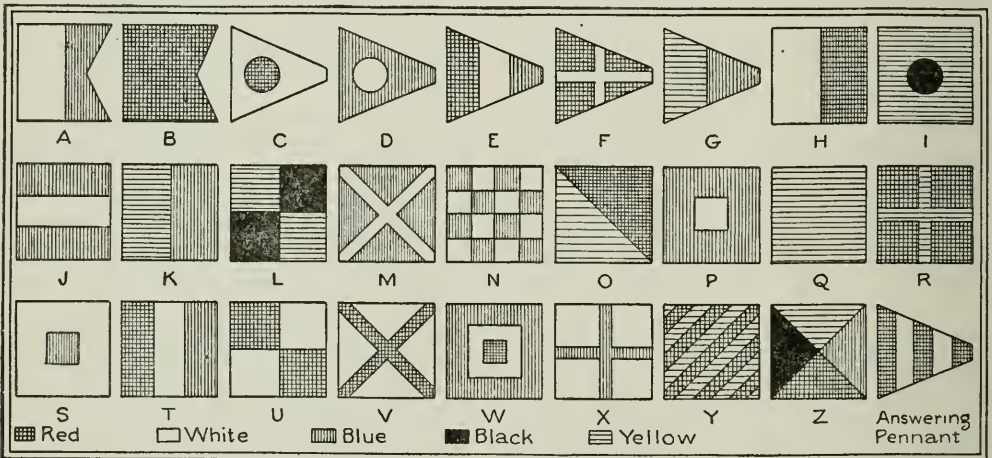
aeroplane and captive balloons, and the corps must be prepared to set up and operate any one of these devices and even to lay cables at an instant's notice.

The World War. During the World War the signal corps of the various armies were the means of enabling the commanding officers to direct the movements of their forces successfully; most of the communications they received were sent from aeroplanes flying over the enemy's lines to ascertain his position and intentions. The information thus gained enabled the commanders so to direct artillery fire as to make it most effective; it also enabled them to move troops to positions where they were most needed during an engagement.

History, in the United States. The signal corps was organized in 1860 when Major

SIGNALING, the art of transmitting messages by means of visual or auditory signs. The various methods of signaling are employed by telegraph companies, by armies, by ships at sea and by railroads. The most efficient signaling is done by means of electricity, and the dot-and-dash system in connection with which it is employed has been applied to the handling of nearly every sort of signaling device. The International Morse code (the telegraph code) is employed in all communications between the United States army and navy.

The most common method of making visual signals is by means of flags, heliographs, lanterns and torches. The first two are used only in daylight (the heliograph only in sunlight) and the latter two at night. The flag indicates the sign by its position; the helio-



INTERNATIONAL CODE OF SIGNALS

Albert J. Myer was appointed chief signal officer. During the Civil War the corps rendered efficient service in all battles and in the navy. In 1870 the Secretary of War was authorized by Congress to provide for taking meteorological observations throughout the country and forecasting the weather by the signal corps. In 1891 this part of the service was organized as the Weather Bureau (which see) and placed under the Department of Agriculture. The signal corps was then organized as a separate branch of the army and placed under the command of General William B. Hazen.

Related Articles. Consult the following titles for additional information:
 Army Navy
 Flag Signaling
 Flying Machine Telegraph, Wireless
 Heliograph Weather Bureau

graph by length of the flash, which is regulated by a shutter. The flag employed for the dot-and-dash code usually has a solid ground with the square of another color in the center. In the United States army it is orange with a red center or red with an orange center; in the navy nearly always it is blue with a white center—sometimes a red and yellow diagonal.

The sender of the flag message stands erect, facing the person who receives it, the flag pole held vertically before him, the flag above his head. The position indicating the dot brings the flag downward to his left in an arc of ninety degrees; the position indicating the dash necessitates a similar movement to the left. A pause after a word or sentence is signified by swinging the flag round to the

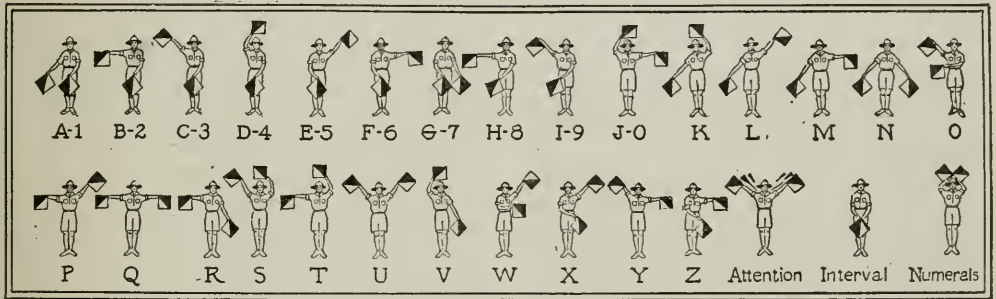
signaler's feet in a position known as "front." The lantern and torch are similarly employed, the only difference being that two lights are necessary—one of them stationary at the signaler's feet, to secure a point of reference. Flashlight communications are delivered with the aid of a shutter, which regulates the length of the beam, the long signifying the dash, the short the dot, as in the case of the heliograph.

The system of signaling known to surveyors and boy scouts is adapted from the two-arm semaphore, which is a stationary pole with two movable arms at the top. The com-

inaudible at a distance of half a mile, and it is necessary to repeat the sound every half minute. The dismal booming at regular intervals of a gun at sea as a signal of distress is another common maritime signal.

For obvious reasons the practicability of military sound signals is limited, such signals having place in the every-day routine of an army rather than serving as a means of communication in presence of an enemy.

SIGN LANGUAGE, a system of communication by gestures and movements of the hands and fingers and without speaking.



BOY SCOUTS' SIGNAL CODE

binations of positions indicate the alphabet and numerals. Two identical flags, usually square and divided in half diagonally by two colors, are employed in the semaphore code.

Although wireless telegraphy has largely superseded all other means of communication at sea, there is an international code employing twenty-six flags of different design—one for each letter of the alphabet—still widely employed for marine signaling. Other important series of signals, each of which has a distinct signification, are those employed by national weather bureaus to indicate forecasts. The heliograph, as its name indicates, is a device which reflects the sunlight. It can be used with the Morse code. (See HELIOGRAPH). Lanterns and torches may be used in the same way in military signaling, though this class of signals is most widely used for lighthouses.

Sound signals, though of considerable importance, are far more limited in use than the visual. The fog horn, the bugle, the whistle, the drum, each has its arbitrary signal. The fog horn is operated either by steam or by air pressure supplied from shore. These are powerful sirens, which may be heard seven or eight miles, though, owing to the effect of fog on sound transmission, they are sometimes

The simplest system is that used by the American Indians of different tribes. Their gestures and symbols were so natural and sprang so directly from their feelings, that tribes often hundreds of miles apart, who rarely came in contact with each other, were able to communicate with little difficulty. The following are typical Indian signs. *Strength* and its allied ideas, in all their applications, were represented by the motion of breaking a strong stick. *Wolf* was represented by two fingers extended at the side of the head, indicating the two erect ears. *White man* was represented by drawing a finger across the forehead, to indicate the presence of a hat or cap.

Since the sixteenth century a sign language has been employed in educating the deaf and dumb. At first the signs were of much the same sort as the Indian signs; later an arbitrary system employing the alphabet was adopted, and by means of it the deaf mute can convey any idea with his hands (see DEAF AND DUMB; ALPHABET). For long distance communication beyond the range of the voice, flags are used, the letter being indicated by the design of the flag itself or by the position in which it is held by the person communicating. See SIGNALING.

SIGS'BEE, CHARLES DWIGHT (1845-), a rear-admiral of the United States navy, born at Albany, N. Y., and educated at Annapolis. He took part, under Farragut, in the Battle of Mobile Bay in 1864. As director of an expedition for exploring the bottom of the Gulf of Mexico, he introduced many original methods and received high honors from his government and from foreign countries. Sigsbee became a captain in the navy in 1897, and was in command of the battleship *Maine* at the time of its destruction in Havana, February 15, 1898. In the Spanish-American War he commanded the auxiliary cruiser *Saint Paul* and afterward the battleship *Texas*. In 1900 he was appointed chief officer of naval intelligence, became rear-admiral in 1904, and later was made a member of the naval general board. He retired from active service in 1907.

SIGURD, *se'gurd*, in northern mythology, the hero of the *Volsung Edda*, identical with the Siegfried of the Germans. When he had grown to young manhood, he was given the sword of his father Sigmund, which Odin, from whom he was descended, had bestowed, and he set forth to slay the dragon Fafnir and to gain possession of the fabulous wealth which Fafnir guarded. After killing this monster, Sigurd ate its heart and was thus enabled to understand the language of the birds, who told about Brunhilde, a Valkyr, who had been condemned by Odin to a deep sleep in a palace surrounded by flames, until she should be awakened by some hero. Sigurd rescued the sleeping maiden, who proved to be so beautiful that he at once fell in love with her. Promising to return shortly to claim her, he again set forth on his adventures, now journeying to the land of the Niblungs.

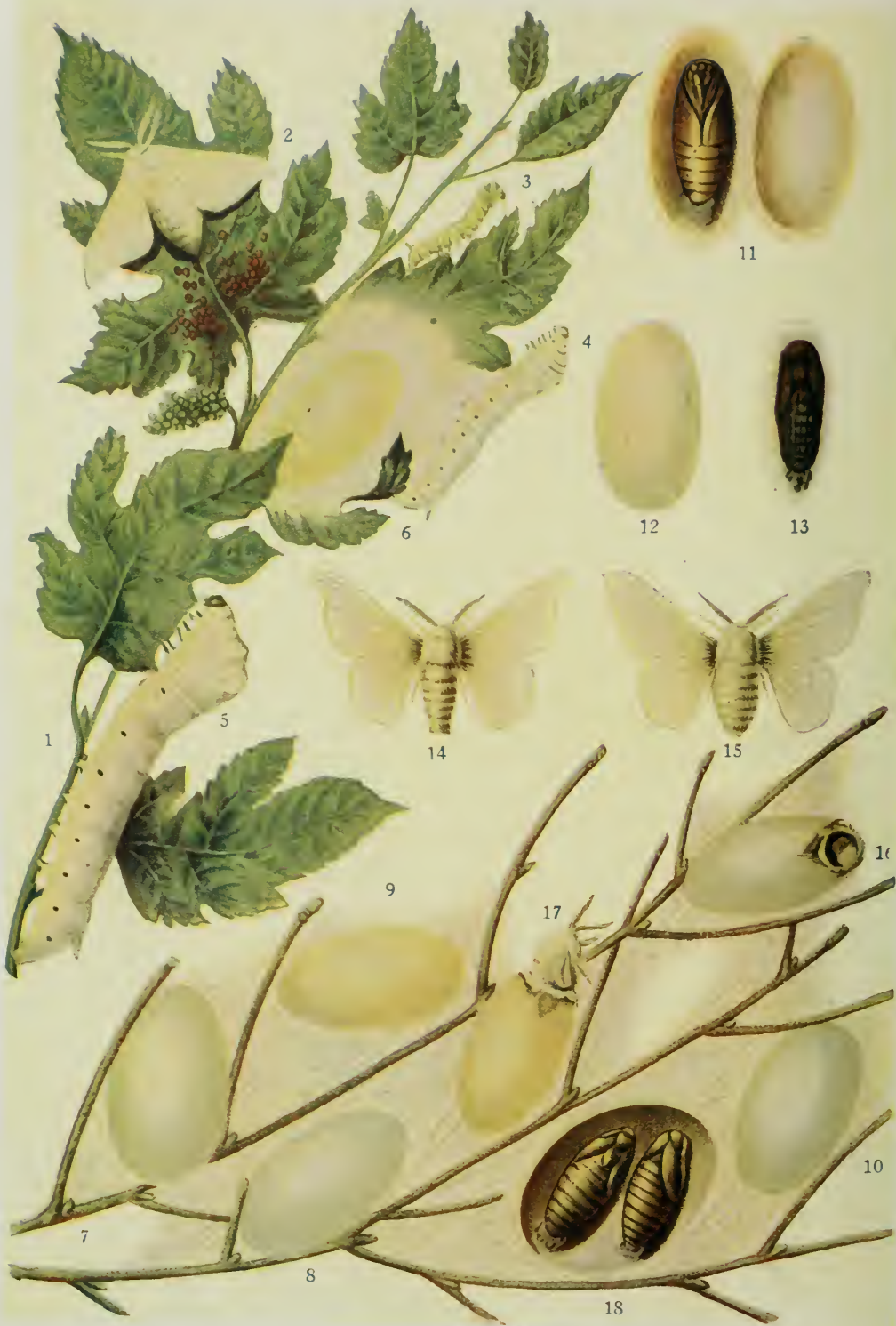
The wife of the king of the Niblungs, a sorceress, brewed for Sigurd a potion which caused him to forget Brunhilde and to fall in love with her daughter, Gudrun, whom he married. Gudrun's brother, Gunther, was desirous of marrying Brunhilde, but she could not be won without a struggle. Sigurd, assuming the form of Gunther, won Brunhilde, but when she came to the court to be married to the prince of the Niblungs, Sigurd, in spite of his love potion, recognized her and was filled with remorse. Brunhilde, unable to forgive him for his apparent faithlessness, had him put to death, and then killed herself on his funeral pyre.

SIKHS, *seeks* (from a Sanskrit word meaning *disciple*), a religious sect in North-western India, of which the Punjab is the principal seat. They are worshipers of one invisible God. Their founder was Nanak Shah, born in 1469, who sought to combine Mohammedans and Hindus into one brotherhood. The political state of the Sikhs was established by Govind Sinh, or Singh, the ninth ruler from Nanak, who abolished the system of castes and gave all men equal rights. Upon his death in 1708, the Sikhs gradually yielded to the superior power of the Mohammedans. A small number, however, escaped to inaccessible mountains and preserved the doctrines of their fathers and an inextinguishable hatred toward the Mohammedans. Later they left the mountains, subdued all Lahore and formed a number of independent communities, each governed by a *sirdar*.

In 1792 Ranjit Singh established himself as their despotic ruler, with the title of Maharajah. After Ranjit Singh's death, in 1839, a period of anarchy followed. In 1845 (First Sikh War) the Sikhs attacked the British under Sir Hugh Gough, at Mudki, resulting in the defeat of the Sikhs at Ferozeshah and the signing of a treaty by which Great Britain held the city of Lahore and a British resident took supervision of the government. In 1849, during the Second Sikh War, the power of the Sikhs was completely broken, and the Punjab was annexed to the British Empire in India. The Sikhs are an agricultural people noted for their great powers of endurance and courage. In 1911 their number was 3,014,466, more than half of whom are in the Punjab.

SI KIANG, *se kyahng'*, or **HONG KIANG**, a river of China, which rises in the province of Yunnan, flows east and southeast and discharges into the China Sea through numerous mouths, on one of which the city of Canton is situated. The Si Kiang is about 1,500 miles long and is navigable for large vessels about seventy-five miles.

SILESIA, *si le'shi a*, before the World War the largest province of Prussia, with an area of 15,568 square miles, in the southeastern section of the Prussian kingdom. Silesia was originally a part of the old Polish kingdom, but was acquired by Austria, and in 1763, at the close of the Seven Years' War, it was ceded to Frederick the Great of Prussia (see SEVEN YEARS' WAR). In 1871 it was incorporated in the German Empire as a Prussian



SILKWORM

1, Branch of Mulberry Tree.
 2, Moth laying eggs.
 3 and 4, Worms in different stages of development.
 5, Full grown Worm.

6, 7, 8, 9, 10, Cocoons of various tints on branches of trees.
 11, Ordinary cocoon opened.
 12, Cocoon with coarse silk removed.

13, Cocoon after the fine silk has been removed.
 14, Male Moth.
 15, Female Moth.

16, Cocoon showing opening made by moth in coming out.
 17, Moth coming out of cocoon.
 18, A double cocoon opened.

province. During the World War the national aspirations of the Poles were encouraged by the allies, and at the close of the war, when the defeat of Germany made a reconstructed Poland possible, the question of ceding Silesia back to the Polish people was brought before the peace conference. According to the original terms of the Treaty of Versailles Germany was required to cede to Poland the greater part of Upper Silesia, including the district of Oppeln (see VERSAILLES, TREATY OF). This provision met with serious objection among the German inhabitants of the designated territory, and the terms were modified to permit a vote of the inhabitants of the disputed territory.

Economically Silesia is one of the foremost German provinces, having the richest coal deposits of the entire country, zinc deposits which are among the most valuable in the world, and rich agricultural lands. In shape the country is an irregular oblong, lying northwest to southeast, and it is traversed about midway almost from one end to the other by the River Oder, flowing northward to the Baltic. Along its southern boundary lie the Sudetic Mountains, the Riesengebirge and other ranges, with peaks from 4,000 to 5,000 feet. Coal is mined in the highlands east and west of the Oder, and in normal times about 90,000 laborers are employed in the mines. The most productive agricultural district lies between the Oder and the southern mountains. The chief products of the soil are oats, rye, barley, wheat, potatoes, beets and forage plants. Cattle raising is an important industry. The weaving and flax-spinning industries are the foremost in Prussia, and there are cotton and woolen mills and earthenware manufactories. The province was formerly divided into three administrative districts, Breslau, Liegnitz and Oppeln. Population, 1910, 5,225,962.

SILICA, *sil'i kah*, a chemical compound of oxygen and silicon, one of the most widely-distributed substances in the earth. Silica forms a principal ingredient in nearly all the earthly minerals. Sand, gravel, sandstone, flint and quartz are composed almost entirely of this material, and feldspar, granite, clay, mica, slate and other rocks contain it. It occurs either in crystals or in amorphous masses. Amethyst, jasper and cat's eye, are crystalized silica; chaledony, onyx, opal and agate are amorphous silica variously colored. Pure amorphous silica is a white powder solu-

ble only in hydrofluoric acid. Silica forms a number of hydrates which have acid properties and from which a great number of salts, known as silicates, are obtained.

SILICON, *sil'i kahn*, a non-metallie element more widely-distributed in nature than any other substance except oxygen. It does not occur in a free state, but is combined with other minerals. It forms the chief constituent of sand, flint, quartz, many other rocks and in some precious stones, occurring frequently in crystalline form. In one form silicon is a brown powder, but it may also exist in a modified form, consisting of shining metallic scales.



SILK. Long before men invented the spinning wheel, or had even begun to clothe himself with the skins of animals, nature had provided the world with some of the most skilful spinners ever known. One of these is a little worm about three inches long, that spins an unbroken thread from 1,500 to 3,000 feet in length. This is the silkworm, and its thread is the fine glossy fiber we know as *silk*. The silkworm is

the caterpillar of the silk moth, which is characterized by a short body, stout legs and white wings, marked by black lines running parallel with the wing borders. When extended, the wings measure about two inches across.

Formation of the Fiber. In the wild state the female deposits her eggs in summer on the leaves of the mulberry tree, but in silk culture the moths are placed on pieces of paper or of muslin, on which they deposit their eggs, which are of a bluish color and about the size of a pin head. Each female will deposit from 200 to 500 eggs. Forty thousand eggs weigh about an ounce. For hatching artificially the eggs are placed in a room heated gradually up to a temperature of about 75° F. The room must be kept scrupulously clean and well ventilated. In eight or ten days the young appear. The caterpillars are then covered with sheets of paper or loose muslin, over which finely chopped young mulberry leaves are scattered. The caterpillars soon find their way through

the meshes of the cloth or openings in the paper to the leaves, upon which they begin to feed.

When first hatched, the worms are black and about a quarter of an inch long. The caterpillar stage lasts from six to eight weeks, and during this period the worm generally casts its skin four times. After casting its skin the last time the caterpillar is about two inches long, and in ten days it attains its full growth of three inches. The body consists of twelve segments, with six fore legs and ten legs on the hinder segments of the body, provided with hooks. The mouth is large, with powerful jaws, and the color is greenish-gray.

At this stage the caterpillar becomes languid, refuses food and prepares to spin its cocoon. If left to itself it will sew two leaves together and spin the cocoon between them, but in silk culture the worms are usually placed in racks containing small cells, to the sides of which the cocoon is attached. The silk thread is formed from a sticky fluid contained in two tubular glands, one on each side of the body, connected with a prominent opening in the lower lip, called the *spinneret*. This opening has two apertures, and as the fluid issues from these in minute streams and comes in contact with the air, it hardens into a strong, glossy thread. When examined under the microscope, one of these threads is seen to be composed of two strands, lying side by side. This appearance is caused by the two minute strands that issue from the spinnerets, uniting as they come in contact and forming one thread. The time required for spinning the cocoon is from three to five days. While doing the work the caterpillar attaches itself to the support by its hind legs and places the thread by moving its head from point to point. The average length of thread in a perfect cocoon is about 1,000 yards, though it may vary from 800 to 1,000 yards.

If left to themselves in a warm place, the cocoons will hatch in about three weeks, but those from which silk is to be obtained are not allowed to hatch. This is prevented by placing them in a warm oven or in hot water, which kills the pupa. It requires twelve pounds of cocoons to yield one pound of raw silk, and one ounce of silkworms' eggs will produce 100 pounds of cocoons. The female moth produces from 300 to 500 eggs. For the successful cultivation of the silkworm,

vigorous and healthy mulberry trees are necessary, the white mulberry being the favorite species. China, Japan, India, Italy, France and Spain are important silk-producing countries, though silk culture is found in several others.

Manufacture. In the manufacture of silk, the first operation is the unwinding of the cocoons and the *reeling* of the silk. For this purpose they are placed in shallow vessels containing hot water, which softens the gummy matter of the cocoons. The ends of the filaments are then conducted by guides to large reels moved by machinery. Four or five threads, from as many different cocoons, are thus brought together, and, uniting by means of the gum, form one thread. The outside fiber is coarser than that which it encloses and is usually taken off separately. The silk thus produced is called *raw silk*. Before it can be woven into cloth the raw silk must be *thrown*. Throwing is often a special trade, but it is usually conducted by machinery in large mills. It consists in spinning, twisting and reeling. Previous to throwing, the silk is carefully washed, wound on bobbins and assorted as to its quality. In the throwing machine it is again unwound from the bobbins, twisted by the revolutions of a flyer and then wound on a reel. The twist of the silk is regulated as required by varying the relative velocities of the flyer and reel. The silk thus prepared is called *singles* and is used for weaving common or plain silks and ribbons. The next operation, called *doubling*, is the twisting of two or more of these threads on one bobbin. This is done in a throwing machine, and the silk thus spun is called *tram silk*, commonly used for the weft of richer silks and velvets. Two or more of these threads of tram silk twisted in the throwing mill together constitute *organzine*, a species of silk thread used for warps of fine fabrics. But in tram silk the threads are all twisted in one direction, forming individual strands like twine, whereas in organzine the collected threads are twisted in an opposite direction to the twist of the strands, like cable or rope. The silk in this condition is called *hard*, in consequence of the gum, which is, however, separated by careful boiling.

Silk is woven on looms similar to those used in weaving cotton and wool (see WEAVING). In the United States power looms are employed wholly, but in Europe many hand looms are still found, while in China they



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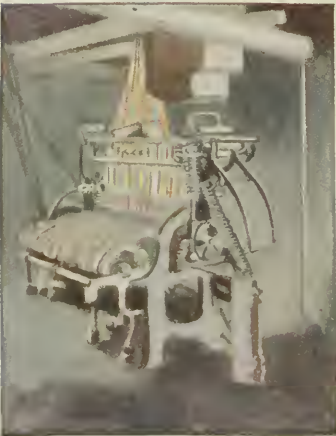
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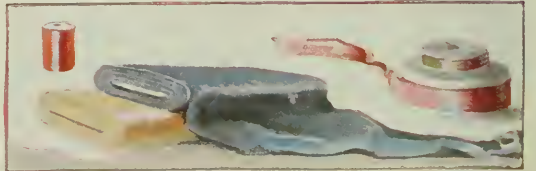
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SILK

1. Feeding mulberry leaves to silk worms.
2. Picking cocoons from branches.
3. Weighing and sorting cocoons.

4. Reeling silk from cocoons.
5. Rewinding silk into skeins.
6. Sorting skeins.

7. Weaving silk.
8. Silk products.
9. Silk factory.

Outline on Silk

- I. SILK MOTH
 - (1) Description
 - (a) Body
 - (b) Legs
 - (c) Wings
 - (d) Number of eggs
 - (6) Organzine
 - (a) Threads twisted in opposite directions
 - (b) Hard silk
 - (7) Weaving
 - (a) Modes
 - (b) Peculiarities
 - (c) Intricacies
- II. SILK WORMS (Wild)
- III. SILK WORMS (Culture)
 - (1) Eggs
 - (a) Number
 - (b) Deposited when?
 - (c) Temperature for hatching
 - (d) Time of incubation
 - (2) Caterpillars
 - (a) Early appearance
 - (b) Care
 - (c) Food
 - (d) Development
 - (e) Casting size
 - (f) Body
 - (3) Cocoon Development
 - (a) Racks
 - (b) Tubular glands
 - (c) Spinneret
 - (d) Time
 - (e) Length of thread
 - (f) Hatching
 - Time required
 - Prevention of
 - (g) Proportionate weight in silk
 - (4) Origin of Industry
- IV. MANUFACTURE
 - (1) Unwinding cocoons
 - (2) Reeling silk
 - (a) Description of process
 - (3) Raw Silk
 - (a) Why and when washed?
 - (b) How wound?
 - (c) How assorted?
 - (4) Throwing—necessary before weaving
 - (a) Spinning, twisting, reeling
 - (b) Usually done by machinery
 - (c) Regulation of twist
 - (d) Single
 - (e) Sewing silk
 - (5) Doubling
 - (a) Tram silk
 - (b) Threads twisted in one direction
 - (8) Waste Silk
 - (a) Consists of what?
 - (b) Processes
 - (c) Use
- V. COUNTRIES
 - (1) Raw Silk
 - (a) China, Japan, Italy, France
 - (2) Manufactured Silk
 - (a) France, Germany, Switzerland, United States
- VI. ARTIFICIAL SILK
 - (1) Composition
 - (2) How produced
 - (3) Value
 - (4) How extensively used?

Questions on Silk

Give three reasons why silk is more expensive than cotton.

Name five articles in your home that are made from silk.

What is the length of a thread furnished by a cocoon?

Why are not cocoons intended for silk permitted to hatch? How is this prevented?

How many pounds of cocoons are required to yield one pound of raw silk?

How many pounds of cocoons will an ounce of silkworms' eggs produce?

During the caterpillar stage how many times does the worm cast its skin?

Describe the formation of the fiber.

How long a continuous thread can the silkworm spin?

What city in the United States produces the most silk cloth?

Why is tin sometimes referred to in silk manufacture?

Is artificial silk an acceptable substitute for real silk?

are used entirely. The fineness and softness of silk fiber make it possible to manufacture from it a greater variety of fabrics than from any other fiber, and these products range in fineness from the gossamer web to the heavy plush used for winter garments. Ingenious looms have been invented by American and French operators, as well as special attachments for weaving intricate patterns, which are now produced at moderate cost.

The manufacture of sewing silk is really a continuation of the process of throwing. It is made by continuing to double and twist the threads together, until a thread of the desired size and strength is obtained. This branch of the silk industry is confined to the United States, and it has become of considerable importance.

The manufacture of waste silk is also an important industry. Only about seven-tenths of the silk on a cocoon can be wound onto the reel. The remainder, together with the coarse fiber taken from the outside of the cocoon and the silk obtained from defective cocoons and those from which the moths have been allowed to escape, constitute the waste. This is subjected to a number of processes, such as washing, combing and spinning, until it forms the spun silk of commerce, which is used for silk yarn and for wool in some silk fabrics.

Production. The silk industry seems to have originated in China, and the Chinese were the first to make known the value and usefulness of the fiber produced by the silkworm. The leading countries in the production of raw silk are China, Japan, Italy and France, while the leading countries in its manufacture, in the order of their importance, are the United States and France. The annual output of silk manufactories in the United States averages over \$196,000,000. The leading states are New Jersey, Pennsylvania, New York, Connecticut and Massachusetts. Paterson, N. J., is the chief center of the industry. The color plate shows the various stages of evolution of the silkworm and silkworm moth.

SILK, ARTIFICIAL, any fine fiber having the appearance of silk and prepared to be similarly used. Both cotton and wood pulp are chemically treated to produce a "silky" fiber, which is much cheaper than silk and for certain purposes is a suitable substitute for it. After the cotton is carded it is steeped in a mixture of nitric and sulphuric acid,

and is then dissolved in a mixture of ether and alcohol. The product is then passed between steel rollers, which squeeze it through tiny tubes. From these it passes into a bath of nitric acid and water. The resulting fibers are wound on reels, then are dried, washed, spun and dyed. Wood fiber is similarly treated.

SILKWORM. See **SILK.**

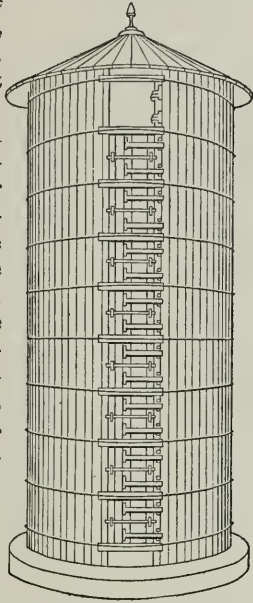
SILKWORM GUT, a material obtained from silkworms and used for the hook end of fishlines. When the silkworm grubs are ready to spin they are soaked in strong vinegar and the silky substance is then drawn from the dead worms and submitted to a special process. About 25,000 pounds of threads are required to produce a pound of gut. The gut is valued for its tenacity and invisibility in the water.

SILO'AM, a pool situated at the southern end of the eastern hill of Jerusalem, the water of which is supplied by the Virgin's Spring and is brought to the pool at the entrance to the Tyropœon valley by a tunnel over 1,700 feet in length. At the Siloam end of this tunnel an important inscription was found in the wall in 1880, which is generally assigned to Hezekiah. He is said to have "made the pool and the conduit, and brought water into the city" (II *Kings* XX, 20). However, other authorities date the inscription back to 200 B. C.

SILO AND SILAGE. A *silo* is a structure in which green crops are stored and preserved in succulent condition for winter feed for stock; *silage*, or *ensilage*, is the name of the fodder stored in the silo. The silo was introduced into America from Europe in 1875 and has rapidly gained favor. While a silo may be square or rectangular, the cylindrical form is found to be the most economical and best adapted to the preservation of the silage. The entire structure must be as nearly air tight as possible, since the presence of air causes decomposition; the inside walls must be perpendicular and smooth to permit uniform settling of the inclosed mass of silage; and this must be of considerable depth so that there will be sufficient pressure to keep the mass compact. Consequently the height should be between twenty-five and thirty feet, while the diameter may vary according to the needs of the farmer constructing it. Wood has been the material generally used in building silos but concrete is rapidly winning favor, as it is cheap, and furnishes an

air-tight, water-proof and vermin-proof structure.

A cylindrical silo 20 feet in diameter and 20 feet high will contain 105 tons of silage and one of the same diameter 25 feet high, will contain 143 tons; while a silo 25 feet high and 25 feet in diameter will contain 224 tons. These figures enable a farmer to judge quite accurately as to the size of a silo which he wishes to build, and the work should be done by one experienced in constructing buildings of this sort. All things being equal, the cylindrical silo is the best. It contains no angles, it is more easily kept tight and is easily cleaned when emptied. Moreover, the cylindrical silo is the strongest form for a structure of this sort, and it is not easily pressed out of shape by the pressure from within.



A PRACTICAL STAVE
SILO

In locating the silo on dairy farms the farmer should carefully consider two things: first, convenience in handling the silage, which must be done at least twice a day; and secondly, the position of the silo with reference to the stable, so that odors arising from it will not penetrate the stable, at least during milking time, since milk readily absorbs odors of this sort. The silo should be as near the stable as possible without danger of contaminating the milk. If the cows are fed after milking time and the stable is thoroughly aired before milking time, there is but little danger from these odors.

The bottom of the silo should be cement or plank, but cement is preferable, since a plank bottom causes a loss of five or six inches of the silage next to it. The sides should be airtight, but the roof should provide ample ventilation. With these points in view, the farmer desiring to construct a silo knows about what to require of the builders. The illustration here given is of a very satisfactory type silo.

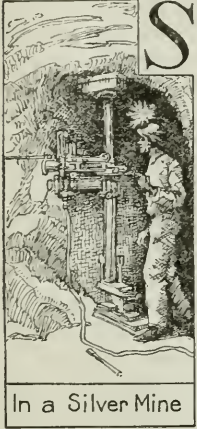
The silo combines the advantages of storing a large amount of feed in a small space and of keeping it in its natural state until used. Moreover, by this means of storage, the farmer can raise upon a few acres fodder, which, if raised under ordinary conditions, would require many times the acreage, and, in addition to this, the silage is much better adapted to the purpose of feeding milk cows than any other sort of dairy food.

Silage, or Ensilage. Various crops are suitable for silage, but experiment has shown that corn is the most desirable. Alfalfa and clover are also used to good advantage. Experiments have shown that the best results are obtained from corn silage when the crop is cut just as the ears are beginning to glaze. As the corn is cut in the field, it is hauled to the ensilage cutter, which cuts it into pieces about an inch in length, using the stalks and ears without separation. As the cut silage leaves the machine, it is carried by an endless belt containing buckets, or by a blower, to the silo. If the plant is dry it should be thoroughly wet after leaving the cutter, before it is packed. Otherwise it soon becomes mildewed. In case of dry crops it is the practice to run a stream of water over the silage as it leaves the cutter. The water tends to make the mass in the silo air tight, and thus prevent fermentation and decay.

When the silo is filled, the ensilage should be covered by some preparation which will exclude the air. Local conditions determine what can be used to the best advantage. The doors in the side of the silo should, of course, be kept closed until the contents have been lowered to each succeeding door. Silage protected from the air will be kept fresh and succulent through the winter, and it is practically as nourishing and healthful as the grass obtained in the average pasture.

SILURIAN PERIOD, a division of geologic time, the third of the Paleozoic Era, following the Ordovician Period, and preceding the Devonian. It is named for the Silures, an ancient people of Britain, where the rocks were first studied. The formations are of wide extent and are found in all the continents. The rocks are largely limestones and sandstones and have been divided into a number of series and stages with local names. In the United States the most noted of these are the Niagara, the Onondaga and the Lower Helderberg. The formations of this system make up the greater part of the

Appalachian Mountains and the sides of the celebrated Delaware Water Gap, and extend southward as far as Tennessee. The gypsum and salt beds of New York and the iron ore along the Appalachian Mountains belong to these formations. See DEVONIAN PERIOD; PALEOZOIC ERA; GEOLOGY.



In a Silver Mine

SILVER, a precious metal, below gold and platinum in value. Silver appears to have been known almost, if not quite, as early as gold. It was used as money in the time of Abraham, 2000 B. C. The foundations of the Hebrew Tabernacle were of silver, and the metal is mentioned among the offerings presented at the completion of that sacred edifice.

Properties. Pure silver is of a fine white color. It is softer than copper but harder than gold, and is about ten and one-half times as heavy as water. Its chemical symbol is *Ag*, which stands for *argentum*, the Latin name for silver. It is next in malleability to gold, having been beaten into leaves only $\frac{1}{100000}$ of an inch in thickness. It may be drawn out into a wire much finer than a human hair. It excels all other metals as a conductor of electricity, and is second only to gold as a conductor of heat. Silver melts when heated red hot, or at 1761° F., and it may be boiled and volatilized by very strong and long-continued heat. When in a molten state it absorbs twenty-two times its volume of oxygen, which it gives off on cooling. If it cools so quickly that a crust forms on the surface before the gas escapes, bubbles of gas explode and break through the crust. This is called *spitting*.

Compounds. Silver forms a number of compounds, several of which are extensively used in the arts. *Oxide of silver* is produced by dissolving silver in a solution of nitric acid and precipitating with an alkali. The compound called *horn silver* or *chloride of silver* is obtained by dissolving silver in nitric acid and mixing the solution with a solution of common salt. When exposed to the light it turns to a blackish color, hence its great use in photography. *Bromide of silver* is the most sensitive to light of all

known solids. It is used for coating the "dry plates" employed in photography. When silver is long exposed to the air, it acquires a covering of a violet color, which deprives it of its luster; this coating is sulphide of silver.

Of the combinations of acid and silver, the most important is *nitrate of silver*, obtained by dissolving silver in nitric acid. If the silver and acid are pure, the solution of silver nitrate is colorless, very heavy and caustic; it stains the skin and all animal substances an indelible black; after evaporation it deposits, on cooling, transparent crystals of nitrate of silver.

Alloys. Silver readily forms alloys with iron, tin, lead, copper and mercury. Pure silver is too soft for most uses and is alloyed with copper. In the United States 900 parts silver to 100 parts copper form the standard alloy for the silver coin. In Great Britain and its colonies the proportions for sterling silver are 925 parts silver to seventy-five parts copper. In countries of the Latin Union the ratio is 835 parts silver to 165 parts copper. The value of silver varies slightly, according to condition of supply and demand; hence gold is taken as the standard in measuring the value of precious metals.

Uses. The most extensive uses of silver are for coinage, and the manufacture of table ware and decorative articles. It is also used for silvering mirrors, and its compounds are employed in photography, in medicine and for other minor purposes.


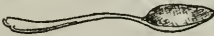





Ores. There are five important silver ores, namely, native silver, vitreous silver, or silver glance, black silver, red silver and horn silver. Native silver occurs principally in veins, traversing gneiss, clay slate and other paleozoic rocks, but not usually in great quantity. It often forms a natural alloy with gold. Vitreous silver presents itself in various shapes and is of a blackish lead-gray color, with a metallic luster. It is malleable, about as hard as gypsum, and is subject to tarnish.

Black silver generally occurs in granular masses, of an iron-black color. It is about as hard as gypsum and presents a smooth surface when cut with a knife. This mineral is a composition of silver with antimony and sulphur and traces of iron, copper and arsenic. It is found in veins, along with other ores of silver, and is a valuable ore for the extraction of silver.

Red silver is found in crystals and often in masses, in grains and even as a fine powder. It is a double sulphide of silver and antimony, containing, on an average, sixty per cent of silver. It occurs in veins with other silver ores, and with galena and blende. Horn silver, or silver chloride, occurs in crystals and also in crusts and granular masses. It contains about seventy-six per cent of silver. It is found in the upper parts of veins in clay slate and also in beds with other silver ores or with iron ore. The above are the ores of silver from which silver is chiefly extracted; but large quantities are obtained from ores of lead and copper, which are worked primarily for these metals.

Reduction of Ore. Silver is obtained from its various ores by smelting, amalgamation and chemical processes which are long and complex. It is most easily separated from lead ore, since the lead melts at a much lower temperature and can be drawn off, leaving the silver free. Before the ore is treated by any of the other processes it is ground to a powder in stamp mills, and the pulverized ore is thoroughly washed in running water, while passing over vibrating tables. The particles containing metal are heavier than the others and sink into grooves, while the light particles are carried away by the water. This process forms what is called *concentrate*, from which the metals are extracted. See METALLURGY.

Production. The silver mines of North and South America are incomparably more important than those of all the rest of the world. The Mexican mines were worked before the Spanish conquest and then produced large quantities of silver. Their total yield has been estimated at over \$3,000,000,000. Great deposits of silver have been discovered in Nevada, Arizona, California, Colorado,

Mexico		77
United States		70
Canada		34
Australasia		17
<hr/>		
Nevada		15
Montana		13
Utah		12

Figures Represent Millions of Ounces
LEADERS IN PRODUCTION

Idaho, Montana, New Mexico and Utah. Silver ore, chiefly silver-bearing galena, has also been found in great quantities in the Barrier

Ranges of New South Wales. Some of the mining concerns here are the largest in the world. Considerable quantities of silver are also produced in Europe. The world's production of silver in 1916 amounted to \$107,519,408. Of this amount the United States produced \$51,083,529; Canada, \$17,477,348; Mexico, \$15,677,866; Peru, \$6,466,513; Japan, \$3,514,927; Spain, \$3,134,007, and New South Wales, \$1,923,151. Owing to the World War, the production of European countries was below their former average.

SIMCOE, JOHN GRAVES (1752-1806), an English general and the first governor of Upper Canada, born in Northamptonshire, England, and educated at Merton College, Oxford. He came to New England during the Revolutionary War, commanding the Queen's Rangers. He took an active part in the war and surrendered with Cornwallis at Yorktown in 1781. He served as governor of Upper Canada in 1791-1794; then became governor of Santo Domingo in 1796-1797, and in 1806 was appointed commander in chief of India. He wrote a *History of the Operations of a Partisan Corps Called the Queen's Rangers*. London, Ont., was founded by him, and Lake Simcoe and the town of Simcoe were named in his honor.



JOHN GRAVES
SIMCOE

SIMILE, *sim'ilee*, a figure of speech in which some form of resemblance between two objects essentially different is designated by means of some definite word, either *as*, *like* or *so*. It is this specific statement of comparison which distinguishes simile from metaphor, wherein the likeness is implied (see FIGURES OF SPEECH). The following are examples of simile:

Life, LIKE A DOME of many coloured glass,
Stains the white radiance of Eternity.
As idle AS A PAINTED SHIP upon a painted ocean.
It cracked and growled and roared and howled
LIKE ICICLES in the sun.
My life is LIKE A STROLL upon the beach.

SIMONIDES, *si mon'i deez* (556-468 B. C.), a Greek lyric poet and one of the most

versatile men of antiquity. He visited Athens, and after the death of Hipparchus, who had treated him very generously, he proceeded to Thessaly, where he obtained the patronage of powerful families. He later returned to Athens, where in competition with Aeschylus he was awarded the prize for his elegy on the warriors who fell at Marathon. When eighty years of age Simonides was victorious in another celebrated poetical contest, his fifty-sixth victory of this nature. Shortly after this he was invited to the court of Hiero, at Syracuse, where he remained till his death. Simonides excelled in his triumphal odes and elegies, which were polished and rhetorical, and gave him rank with Pindar, his contemporary and rival. See PINDAR.

SIMON PETER. See PETER.

SIMOOM', or **SIMOON'**, a hot, dry wind that blows over the Sahara and Arabian deserts, carrying great clouds of dust. It is caused by the intense heat of the sandy plains. The air, heated by contact with the noonday burning sand, ascends, and the inflow of colder air from all sides forms a whirlwind, or miniature cyclone. Its intense, dry, parching heat, combined with the cloud of dust and sand which it carries with it, makes this wind very destructive to both vegetable and animal life. Caravans cannot proceed through it. When suddenly overtaken by one of these sandstorms travelers, to escape suffocation, lie down and cover their heads with blankets, and camels bury their noses in the sand. The simoon may last a few minutes or it may continue for days.

SIM'PLON, a mountain pass of Switzerland near the frontier of Piedmont, Italy, over which the famous Simplon road, one of the greatest engineering feats of modern times, was constructed by Napoleon in 1800-1806. This pass, which is one of the most important routes across the Alps, is about thirty feet broad and forty-two miles long, and is carried over 611 bridges and through numerous great tunnels.

The Simplon Tunnel, a railway tunnel through the Alps at this point, was commenced in 1898 and completed in 1906. It is the longest railway tunnel in the world, consisting of two tubes, each having a single track. The length is over twelve miles.

SIMP'SON, SIR JAMES YOUNG (1811-1870), a Scotch physician, the most eminent medical practitioner of his day and the discoverer of the anesthetic properties of

chloroform. He was born at Bathgate, and was educated at the University of Edinburgh. For his discovery of chloroform anesthesia and its introduction at childbirth and his invention of a means of arresting the loss of blood in hemorrhage, he received honors from numerous scientific societies in America and Europe. He was created a baronet in 1867. See ANESTHETIC; CHLOROFORM.

SIMS, WILLIAM SOWDEN (1858-), an American naval commander, promoted to the rank of vice-admiral in 1917, after America entered the World War. He was born at Port Hope, Ontario, and was educated for the sea at the United States Naval Academy at Annapolis, from which he was graduated in 1880. Between 1897 and 1900 Sims served as naval attaché to the American embassies at the capitals of France and Russia, and during Roosevelt's administrations was inspector of target practice at the Bureau of Navigation. Following this he was commander of the *Minnesota*, a member of the Naval War College, commander of the Atlantic torpedo flotilla, president of the Naval War College, and commandant of the Second Naval District. In August, 1916, he was promoted to the rank of rear-admiral. After America entered the World War he was placed in charge of the American squadron operating in European waters, and while he was abroad he was made vice-admiral, thus attaining the rank of the chief British and French officers with whom he was associated.

SINAI, *si'ni*, or *si'na i*, a mountain in Arabia, at the base of which Israel encamped and from the summit of which Moses is supposed to have received the Ten Commandments. It is one of three peaks of the mountain range on the peninsula of Sinai, which projects into the Red Sea, between the gulfs of Suez and Akabah. In literature the word Sinai is used figuratively to symbolize the legal side of God's treatment of men.

SINCLAIR, UPTON [BEALL] (1878-), an American author and one of the founders of the Intercollegiate Socialist Society, was born at Baltimore, Md. He was educated at the College of the City of New York and at Columbia University. Because of his exposure of conditions at the Chicago stockyards in his novel, *The Jungle*, a government investigation was undertaken. To carry out his ideas on coöperative housekeeping, the Helicon Home Colony was founded in 1906 near Englewood, N. J., but fire destroyed its

buildings before the experiment was fully worked out. In 1917 Sinclair withdrew from the Socialist party because of the opposition of this body to American participation in the World War. His writings include *Springtime and Harvest*, *The Industrial Republic*, *King Midas*, *The Money-Changers*, *The Cry for Justice*, *King Coal* and *The Profits of Religion*.

SIN'DIA, the hereditary title of the head of the Mahratta dynasty which played a conspicuous part in the history of India in the eighteenth and nineteenth centuries. The Sindia arose in Gwalior, which was founded in 1738 by Ranoji Sindia. In 1781 Madaji Sindia, the most powerful member of the Mahratta confederacy, negotiated a peace between the British and the Mahrattas, and having introduced European discipline and tactics into his army, possessed himself of Delhi, Agra and the person of the Mogul emperor, in whose name he subsequently acted. Several of his successors engaged in open conflict with the British.

SINDING, *sin'ding*, CHRISTIAN (1856-), a Norwegian musical composer and teacher, educated in Germany, and Austria. His compositions suggest the spirit of the Northlands and are characterized by charm of melody and excellence of construction. His principal works include a pianoforte quartet and quintet, three violin sonatas, two symphonies and the *Rondo Infinito* for the orchestra; his opera *Der heilige Berg* was produced in Berlin in 1910.

SINGAPORE', a British colony, forming one of the Straits Settlements and consisting chiefly of the island and city of Singapore, with a few smaller islands. The principal island is about twenty-seven miles long and fourteen miles wide and has an area of 217 square miles. Its location gives it a hot climate throughout the year, though it is not unhealthful. The chief interest centers in the city of Singapore. The chief public buildings consist of the Cathedral of Saint Andrew's, the townhall, the courthouse and the Roman Catholic Cathedral. It has one of the finest botanical gardens in the world. Singapore is the meeting point of numerous important ocean routes. It is a free port and carries on an extensive trade. Population, 1916, estimated, 369,000, of whom over sixty per cent were Chinese.

SING'ING, the art of making music with the human voice; also the music thus pro-

duced. The mechanism by which this music is made consists of the lungs, which supply the air; the muscles of the diaphragm, or chest, which force the air through the throat, and the vocal chords of the throat, whose vibrations produce the sound. Difference in pitch of voice is due to the length of the vocal chords; difference in quality is due to the differences in the shape of the cavities of the mouth and nose and to the different use of the muscles of the larynx. The compass of the human voice is from about C below the bass clef to F above the treble, though no single voice has this compass, the average being about twelve to fifteen tones, and the greatest, slightly over three octaves. The total range of the voice is divided into four parts, the *soprano*, including the highest tones, beginning at about E on the treble clef; the *alto*, or *contralto*, including those from about G on the bass clef to C on the treble clef; the *tenor*, including the range of the contralto, but extending somewhat lower, and the *bass*, including all the lower notes, beginning at about C above the bass clef and extending downward. See MUSIC.

SINGLE TAX, the name given by common consent to the economic reform which proposes the abolition of all taxes on personal property and the raising of public revenues, local, state and national, by a single tax on land values, irrespective of improvements, this tax eventually to become equal to the annual rental value of the land. The theory of the single tax is based upon Ricardo's "law of rent," which, briefly, is this: "The economic rent of a given piece of land depends upon (or is determined by) the excess of its product over that which can be obtained with an equivalent effort from the least productive land in cultivation." By taking this economic rent (that is, the excess of product of a particular piece of land, over that which can be obtained from the least productive land in use—or at the so-called "margin of cultivation") for public purposes (taxes), those who are now holding the lands without using them, in order to secure in the future a higher value, would no longer be able to do so with profit, since the benefit which they have been receiving would now be confiscated to the State. Thus, vast areas of land would be thrown open to practically free employment; the opportunities for labor would be nearly equal, and the reward to labor would be approximately the

whole product, except what would be taken for interest on the capital invested.

In proof of their assertions, single taxers point to statistics. For instance, the unimproved land within the limits of the city of Chicago constitutes a large part of the total area and would furnish employment for thousands of persons. They justify the confiscation of land values (for the taking of the whole rental value would amount to the confiscation of the land), partly on the basis that this value is created by the community and cannot be rightfully monopolized by individuals. Furthermore, they contend that private ownership of land must eventually reduce the majority of mankind virtually to a condition of slavery; for wealth can be produced only by the application of labor to land (that is, to all natural agencies, including earth, air, water); therefore, either the owner of the labor (man) or the owner of the opportunity to labor (land) can control the laborer and can make such terms with him as he pleases. This condition is brought constantly nearer by the withholding from use of large tracts of land, while the growth of population and other conditions constantly increase the competition of laborers for employment, that is, for the right to use the land. Believing as they do that the original act of reducing land to private ownership was wrong and worked an injustice, not only upon those from whom the land was taken, but upon all who came after, they believe the State has a perfect right to reverse this step and retake for the community, by taxation, the value of land, without compensating the present owners.

The single-tax theory has gained many adherents, especially in England and the United States, during the last quarter of a century, chiefly through the propaganda of Henry George, an American economist who first thoroughly elucidated the principles of the theory, though the idea had been before developed in a crude way by French economists. George's first great work on the subject was *Progress and Poverty*. It immediately became popular and has been translated into all the languages of the civilized world (see GEORGE, HENRY). But the theory has never been given a practical test, though it has been partially applied in New Zealand and in small divisions of other countries. At Fairhope, Ala., is a small colony of single taxers who are attempting to work out their

principles in practical life. Their efforts have been attended with some success. Some of the important demands of the single taxers are being accepted and incorporated in the laws of several of the states, especially the abolition of the tax on personal property, the reform being urged in many instances on the ground that this form of property is so easily concealed that persons of small means pay vastly more, in proportion to their ability, than those of wealth, and, further, that the methods of assessment place a premium upon perjury and corruption.

The main objections that are urged to the single tax are the following: (1) That it would relieve a large class of persons from support of the government; (2) that the tax would be inelastic; (3) even though the justice of the principle of the single tax be granted, for the sake of argument, the fact that private ownership of land has been recognized for centuries and has led to the development of many interwoven interests, would make it inexpedient for the community to recover possession of the land by the means proposed. See TAX; RENT.

SING SING, N. Y. See OSSINING.

SINN FEIN, *sin fayn*, a society of Irish nationalists whose sole aim is to overthrow British rule and make Ireland an independent state. In the ancient Gaelic tongue of Ireland, *Sinn Fein* meant *ourselves alone*. Its first use politically was as the name of a patriotic newspaper, the readers of which furnished the nucleus of the society. With the growth of the society, which is composed largely of leading Irish thinkers, the *Sinn Fein* has become in recent years a "movement." In April, 1916, an armed rebellion of Sinn Feiners broke out in Dublin, but was put down by the British, and Sir Roger Casement and other leaders were executed. The movement did not perish, however. On the contrary, the party gained such strength that it won about seventy seats in the Parliamentary election in December, 1918. The elected delegates refused to take their places in the Parliament at London, but gave all their energies to setting up an independent republic with a Parliament at Dublin. See IRELAND, subhead *History*.

SIOUAN, *soo'an*, **INDIANS**, those related Indian tribes who occupied the land of the upper Mississippi and Missouri valleys, far into Canada, and included detached tribes east of the Mississippi. Among Siouan

tribes are the Dakota, or Sioux, the Omaha, the Winnebago, the Assiniboin, the Osage and the Quapaw. Some of the tribes were bitterly hostile to the whites, and the fierce and warlike temperament of such tribes as Dakotas was the source of considerable trouble to the United States government for many years.

Related Articles. Consult the following titles for additional information:

Assiniboin	Quapaw	Sitting Bull
Osage	Sioux	Winnebago

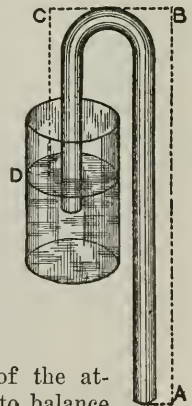
SIoux, *soo*, or **DAKOTA**, the largest tribe of Indians dwelling west of the Mississippi, and the most troublesome of all the tribes belonging to the Siouan group. Originally they occupied the country between the Arkansas River and the vicinity of Lake Winnipeg and west almost to the Rocky Mountains. Because the United States government failed to carry out certain agreements made with them, they went on the warpath in 1862 and killed nearly 1,000 settlers. Another uprising in 1876 caused the death of General Custer and all his men, in the battle of the Little Big Horn. Eventually the Sioux were subdued and retired to their reservations in the Northwest. They now number about 22,000, and are brave, intelligent and progressive. See **SITTING BULL**.

SIoux CITY, IOWA, the second city in size in the state and the county seat of Woodbury County, is located on the Missouri River, at the mouth of the Big Sioux River, 156 miles northwest of Des Moines. It is on the Illinois Central, the Chicago & North Western, the Chicago, Saint Paul, Minneapolis & Omaha, the Great Northern, the Chicago, Milwaukee & Saint Paul and the Chicago, Burlington & Quincy railroads. The city is the sixth largest live stock market in the United States, having large meat packing plants and stockyards that do a large business. It has thirty-four wholesale and jobbing houses and 150 factories, including railroad repair shops, brick and tile works, planing mills, and other industrial establishments. Two bridges cross the Missouri River, one, a combination bridge affording facilities for railroads, street cars, vehicles and foot passengers. Sioux City is the seat of Morningside College and Trinity College, has six hospitals, a Federal building, a city hall, and a Carnegie Library. Its largest park is Stone Park, containing 800 acres. It has a Y. M. C. A. building and an auditorium seating 3,000. A \$750,000 courthouse has recently been erected. Sioux city was

first incorporated in 1857, became a city of the first class in 1886, and adopted the commission plan of government in 1910. Population, 1910, 47,828; in 1917, 58,568 (Federal estimate).

SIoux FALLS, S. D., the county seat of Minnehaha County, about ninety miles north of Sioux City, Iowa, and eight miles from the Iowa State line, on the Big Sioux River and on the Great Northern, the Illinois Central, the Chicago, Rock Island & Pacific, the Chicago, Milwaukee & Saint Paul and the Chicago, Saint Paul, Minneapolis & Omaha railroads. The river has a series of falls, descending about 100 feet in half a mile and furnishing extensive water power. The city contains a large packing plant, a biscuit factory, brickyards and extensive granite quarries, from which are taken a beautiful pink jasper building stone. It has large wholesale houses, and is the center of a valuable trade. The educational institutions include the Sioux Falls College, a Lutheran normal school, All Saints' School (Episcopal) and the state school for the deaf. The city is the seat of an orphans' home and of the state penitentiary. It has a Federal building, and a Carnegie Library. Sioux Falls was chartered as a city in 1883. It adopted the commission form of government in 1909. Population, 1910, 14,094; in 1917, 16,887 (Federal estimate).

SIPHON, *si'fahn*, a tube with one curved end, shaped like an inverted U, used to convey a liquid from a higher to a lower level. The illustration shows the principle upon which the siphon works. If all the air is exhausted from the tube and the two ends are placed in liquid, the pressure of the atmospheric air on the surface at *D* will force the liquid up into the tube to the level *CB* and cause it to flow into the arm *BA*. A liquid would not flow through a siphon if the highest point in the tube were thirty-three feet above the level *D*, because the pressure of the atmosphere is not sufficient to balance its weight at higher levels. The principle of the siphon is employed in devices for conveying water over slight elevations, and in emptying casks and other vessels.



SIR, a title formerly meaning *master, lord* or *sovereign*. It is a contraction of *sire* formerly applied to sovereigns, but is now most frequently applied to those upon whom the British government wishes to confer distinction because of their position in the nobility, or because they have rendered some distinguished service to mankind or to the British government. Thus, Henry Bessemer, the inventor of the process of making Bessemer steel, was given the title of *Sir*. Since *Sir* was the distinguishing title of knighthood in the Middle Ages, one upon whom the title is conferred is said to be knighted. See CHIVALRY.

SIREN, an instrument for the production of continuous sounds, used extensively in England and France during the World War as a warning for the approach of air raids. Very large sirens are used for fog signals at lighthouse stations, steam being employed instead of air, with a trumpet-shaped horn to direct the sound. The siren is also used for measuring the number of sound waves, or vibrations, per second, which produce a note of given pitch. In its original form it consists of a disk, with a circular row of oblique holes, revolving close to the top plate of a wind chest, perforated with corresponding holes, sloping in the opposite direction, so that the jets of air from the latter, passing through the former, keep the disk in motion. These jets of air also produce a note, corresponding to the rapidity with which the plate is revolved or the frequency with which the holes in the plate coincide with those in the chest. The number of coincidences or vibrations in a given time is shown by indices connected with the axis of the disk.

SIRENS, in Greek mythology, the name of several sea nymphs, who by their singing enticed sailors to their island, near the Sicilian coast, and then killed them by starvation. Warned of the danger, when Ulysses approached their island, he stopped the ears of his companions with wax, bound himself to the mast, and thus escaped. The sirens then threw themselves into the sea, where they became formidable rocks. Another version is that they hurled themselves into the sea when vanquished in music by Orpheus.

SIRIUS, *seer'ius*, the dog star, the brightest star in the heavens, situated in the constellation Canis Major; or the Great Dog. It is estimated to have more than thirteen times the sun's magnitude. A companion

star to Sirius was discovered in 1862 which gives out one ten-thousandth part of the light of Sirius.

SIROCCO, *si rok'o*, the Italian name for a hot wind, but properly applied to any warm wind of sufficient duration to produce a general climatic change. Siroccos are common over the southern portion of the United States and the countries bordering the Mediterranean in the north, being especially the scourge of Sicily, although the term particularly refers to the warm wind of the Sahara. The sirocco here should be distinguished from the simoom which is much more violent, though both winds produce dust storms.

SISAL, *sis sahl'*, or *sis'al*, or *s'i'sall*, a tall tropical plant, the swordlike leaves of which yield a valuable fiber used for the making of binding twine, coarse cloth, hammocks, bags, etc. Sisal is native to Yucatan, Mexico, and is also cultivated in limited quantity in Florida, the Bahamas, the West Indies, and parts of Central America. Progreso, the chief port of Yucatan, exports to the United States annually 200,000,000 pounds of this fiber.

Sisal is grown upon stony ground, and its leaves are from two and three feet long. The pulp is cleaned from each side of the leaf and the remaining fiber is then washed and sundried.

SISTERS OF CHARITY. See CHARITY, SISTERS OF.

SISTERS OF MERCY. See MERCY, SISTERS OF.

SISTINE, *sis'tin*, or *sis teen'*, **CHAPEL**, the private chapel of the Pope in the Vatican, built for Sixtus IV, in 1473, by Giovanni de Dolci, a Florentine architect. The screen separating the congregation from the section reserved for the Pope and cardinals is one of the foremost pieces of marble decoration of the early Renaissance period. The floor mosaics and frescoes on the walls and ceiling are equally famous. The walls are a museum of works of leading Tuscan and Umbrian painters of the later fifteenth century, with masterpieces of Botticelli, Ghirlandaio, Perugino and many others. Among the ceiling frescoes are Michelangelo's *Creation, History of Noah*, and the celebrated *Prophets and Sibyls*. The entire altar wall is covered by his *Last Judgment*, the largest fresco in the world (see MICHELANGELO).

Most of the functions at which the Pope personally participates take place in the

Sistine Chapel. The Papal elections are also held there.

SISTINE MADONNA. See RAPHIAEL; MADONNA; PAINTING.

SISYPHUS, *sis'ifus*, a mythical king of Corinth, who promoted navigation and commerce, and who was so crafty that he even deceived the gods. For his wickedness he was punished in the lower world by being obliged to roll a heavy stone to the top of a hill which always rolled down again, thus rendering his task eternal.

SITKA, ALASKA, its former capital, is situated on the west coast of Baranof Island, 1,130 miles north of Seattle and 160 miles southwest of Juneau. The town has a picturesque site, near a number of mountain peaks covered with perpetual snow. The climate is mild, considering the latitude. The chief buildings are the Greek church, begun in 1816; a church connected with the Presbyterian mission, and the school buildings of the Russian-Greek church, the United States government and the Presbyterian industrial training school. Other institutions of importance are the barracks, an agricultural experiment station, the governor's residence, the United States land office and a marine hospital. The chief industries are mining, lumbering and salmon canning. Sitka was the old Russian capital of Alaska and until 1906 was the seat of government for the territory under the United States; in that year the capital was transferred to Juneau. Population, 1910, 900 natives and 160 whites.

SITTING BULL (1837-1890), a famous chief of the Sioux tribe of North American Indians, born at Willow Creek; Dakota. From the very first he showed bitter hostility to the white settlers in the Northwest, and was conspicuous in many attacks upon them. At the Battle of Mussel Shell, in the Yellowstone region, in 1868, his forces were defeated, and from this time until 1876 he fought friendly Indians and raided Montana settlements. In 1876 a campaign was undertaken against him, during which General Custer and his force were massacred. Later he escaped to Canada, but on promise of pardon he surrendered to General Miles, in 1881. He again instigated rebellion among the Indians and was killed while resisting a government order for his arrest.

SIUT, or **SIOUT**, *se oot'* (also written ASSIUT), the chief town of Upper Egypt and the capital of the Province of Siut, situated

on the west bank of the Nile, 248 miles south of Cairo, and on the Nile Valley Railroad. It is the official seat of residence of the governor of Upper Egypt. It is a well-built town and trade center. It has manufacturing industries of considerable value and is noted for its red and black pottery and pipe bowls. A large dam has been constructed across the Nile at this point, to regulate the flow of water for irrigation purposes. Near the city are a number of ancient tombs, cut in the rocks. Population, about 42,750.

SIVA, *se'va*, the name of the third of the three great Hindu deities (Brahma, Vishnu and Siva), variously designated as the destroyer and the creator, or regenerator. He is frequently represented with five faces and from two to ten hands; a third eye is in the middle of his forehead. He wears a necklace of human skulls and carries a trident supported by a skull. He has been known by almost a thousand names. See BRAHMA; VISHNU.

SIX NATIONS, THE. See FIVE NATIONS.

SIXTUS, the name of five Popes, of whom Sixtus IV and Sixtus V were the most noted.

Sixtus IV, who was Pope from 1471 to 1484, was a patron of art and learning. Among the works commemorating his reign are the Ponte Sisto and the famous Sistine Chapel of the Vatican.

Sixtus V was Pope from 1585 to 1590. As Pope he actively pursued criminals and purged Italy of bandits and mendicants. An able financier, he replenished the Papal treasury, which at his accession he had found exhausted, and left at his death three million dollars available to his successor. He also greatly enriched the Vatican library, collecting from the monasteries countless valuable manuscripts and placing them in the hands of competent translators. He built new additions to the library and had the arrangement of books so perfected that it has been since that time the admiration of all students who visit Rome. He founded the Vatican Press and had printed the works of Gregory the Great, Saint Bonaventure and other learned divines; also, the Septuagint and the Vulgate, published in 1590. The Scala Santa, by which, according to tradition, Christ ascended to the hall of Pilate at Jerusalem, was raised by Sixtus's direction. In his brief reign, this pope accomplished more for Rome and the Catholic Church than any of his predecessors in a like period.

SKAGERRAK, *skah'ger rak*, a broad arm of the North Sea, which washes Norway on the north, Jutland on the south and Sweden on the east, where it communicates with the Cattegat (which see). Its length is about

150 miles; its breadth, eighty miles. Its depth varies from thirty to more than 200 fathoms. There are several good harbors on the Norwegian and Swedish coasts. In the Skagerrak, in 1916, was fought a great battle between the British and German fleets (see WORLD WAR).

SKAGWAY, *skag'way*, ALASKA, a subport of entry in the southern district of Alaska, situated on Lynn Canal. It is an important terminus for railroad and steamship lines and is a distributing point of supplies to the interior; through it also pass supplies to and from the Canadian Klondike. It has a public library, three hospitals and a United States government building. Population, 1914, 800.

SKALDS, or **SCALDS**, *skahldz*, or *skawlds*, poets and historians of the Scandinavian races who flourished from the ninth to the latter half of the thirteenth century. They lived at the courts of princes and sang the praises of their gods and celebrated the exploits of their national heroes. A list of over two hundred of the most distinguished skalds is preserved in the Icelandic language.

SKAT, *skaht*, a game of cards, played with a euchre deck by three, four or five persons, for sixty-one points. The cards in the tricks taken count as follows: ace, eleven; ten spot, ten; king, four; queen, three; knave, two. The four knaves, which are called *matadors*, are the highest trumps and rank in order of suits, clubs, spades, hearts and diamonds. Only three take part in active play at each deal. Five cards are dealt to each of the players. The next two cards are laid face down on the table, then five more are dealt to each of the same players. The two which are laid face down on the table are called the *skat*. Suit must be followed if possible; if not, any card may be played. By means of bidding and passing the bid, in which the rank of the suits is considered, the one who is to lead is selected. The counting is complicated, and the method should be studied from a manual. The game was invented in 1817 in Altenburg and is very popular among Germans. It is played to a considerable extent in the United States, but its difficulty has prevented it from becoming more generally popular.

SKATE, a broad, flat-bodied fish belonging to the ray family, usually found on sandy bottoms near the shore. The chief portion of the body is made up of the expanded pec-

toral fins, which are concealed under the skin. The tail is long and slender; the snout is pointed, with a prominent ridge, or keel. The common skate of the Atlantic coast of North America is a foot or two in length; the *barn-door skate* is four feet long; and the *California skate*, the largest of the American species, is six feet long. Most species are edible.



SKATE

SKATES AND SKATING. A skate consists of a steel blade affixed to a wooden or metal base and fastened to the shoe by means of straps, clamps or screws.

The *club skate*, with its rocker-shaped blade, is entirely of metal, and is clamped on the foot; the *Hudson River*, or *Donoghue skate* is straight-bladed, with wooden top and straps; the *Norwegian skate*, ranking as the best, has a blade similar to the Hudson River skate, but is very light in weight and is screwed to the sole of a special skating shoe.

Skating. Skating seems to have been a sport of great antiquity, mention being made of it in the Edda. In Holland, from time immemorial, skates have been used by all classes of people upon the canals and rivers, because of their facility of locomotion. In the United States few outdoor sports draw such large crowds as skating and most of the northern cities make provision at public expense for skating on the lagoons in the public parks. Local and municipal contests are held for championships. Frequently contests have been held between European and American champions. Of late at places of public amusement there is great vogue for indoor ice skating.

SKEAT, *skeet*, WALTER WILLIAM (1835-1912), an English student of languages who wrote nearly fifty books relating to his specialty, nearly all of which have become standard authority on the subjects covered by their titles. Among these are *Etymological Dictionary of the English Language*, *Primer of Classical and English Philology* and *The Science of Etymology*. He was born in London, and educated at Cambridge.



SKEL'ETON, the hard framework that supports and protects the soft tissues of animals. It may lie within these tissues, as with man and the higher animals, or without them, as with turtles, mollusks, etc. The human skeleton is made up of about 200 bones, of which seventy-four belong to the axial skeleton—head, neck and trunk—and about 126 to the appendicular skeleton—the extremities. The number of bones varies a little from infancy to the adult period.

Axial Skeleton. The upper part of the human spine, or vertebral column, is made up of twenty-four separate bones called vertebrae, seven in the neck (cervical), twelve in the chest region (dorsal), and five in the loins (lumbar). To the dorsal vertebrae are attached the ribs, twelve on each side. The ribs are tipped in front with cartilages, which in the seven upper, or true, ribs, join them to the sternum. Of the remaining five, or false, ribs, the upper three are fixed to the cartilages above, but not to the sternum, and the lower two are free, or floating.

They form an easily expanded cavity for the heart and lungs, and as they are easily compressed because of the cartilages, should not be pressed out of position by tight clothing.

The *sternum*, or breast bone, occupies the front of the chest, articulates at its upper extremity with the two clavicles, or collar bones, and gives direct articulation to the seven upper ribs on each side. Below the vertebrae is the sacrum, composed of five separate bones in childhood, but growing into a solid structure in the adult. The sacrum forms the keystone of the pelvic girdle, distributing to the pelvis and lower limbs a large part of the bodily weight. At the tip of the spinal column is the coccyx, made up in infancy of four bones which become united in adulthood.

Strength, combined with great elasticity and flexibility, is provided for the spinal column by anterior, posterior and lateral ligaments, by pads of cartilage placed between

the vertebrae and by an alternation of anterior and posterior curves in the four principal regions. Hollows through each of the vertebrae form a passage for the spinal cord, and from this central axis branch nerves to all the vital centers. If maladjustment of the vertebrae and spinal curvature occur, there are likely to be serious nerve disturbances and interference with the bodily functions.

Upon the two upper vertebrae, the *atlas* and the *axis*, rests the skull. Hollows in the atlas fit projections on the skull, and the head is thus allowed to move forward and backward. The axis has a peg that projects upward through the atlas, allowing movement of the head from side to side.

The skull is composed of twenty-eight bones, divided into those of the *cranium* and the *face*. The cranial bones encase the brain and are eight in number, namely, occipital, two temporal, two parietal, frontal, ethmoid and sphenoid. They are united by sutures, which somewhat resemble dovetailing in carpentry, thus allowing a symmetrical development or growth at the edges. The bones themselves are made up of two layers, with a porous substance known as the arachnoid membrane lying between. This arrangement gives the cranium power to resist blows and to prevent a jar from being easily communicated to the brain.

The bones of the face, fourteen in number, are the nasal, two superior maxillary, two lachrymal, two malar, two palate, two inferior turbinated, vomer and inferior maxillary bones. The remaining six bones of the skull are the tiny bones of the inner ears.

At the base of the tongue and attached to it is a bone known as the *hyoid*. No fewer than ten muscles arise from or are inserted into it. It articulates with no bones, but is suspended from the skull and supports the larynx by a ligament.

Appendicular Skeleton. This skeleton comprises the shoulder girdle, with the upper extremities (sixty-four bones), and the pelvic girdle, with the lower extremities (sixty-two bones). The *shoulder girdle* includes the clavicle, or collar bone, and the scapula, or shoulder blade. The *clavicle* is a slender bone, shaped like the italic *f*, extending from the sternum to the scapula, and attached to each by cartilage. It prevents the shoulder from falling toward the chest and gives freedom to the shoulder movement. The *scapula*

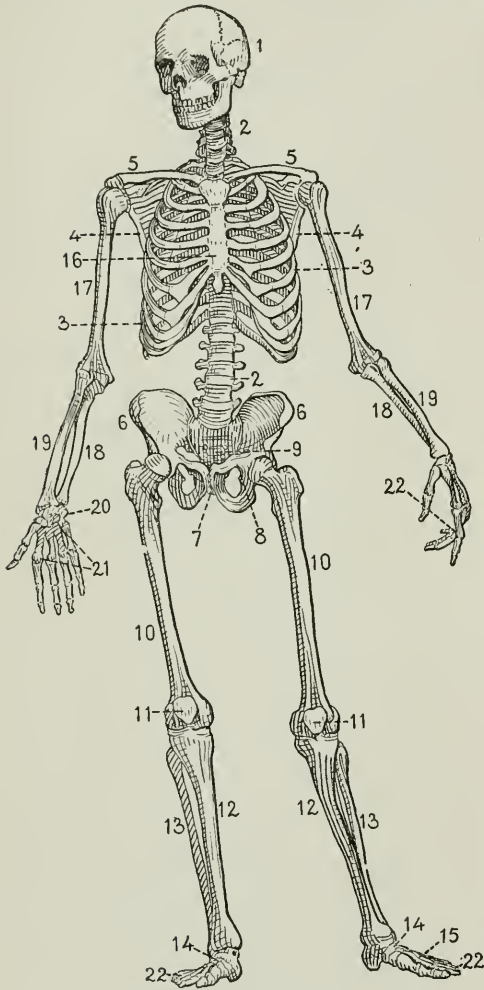
is a flat, irregular, triangular bone, lying outside the ribs, at the back of the chest, but separated and suspended from it by muscles.

The upper extremities include the following bones on each side; the humerus, the forearm,

latter on the inside, each uniting with the humerus by a hinge joint. At their lower extremities the bones of the forearm join the carpus, the radius directly and the ulna indirectly, through the intervention of a small fibro-cartilage. The ulna is heaviest at the end which joins the humerus, and the radius is heaviest at the end which joins the carpus. (3) The *carpus*, or wrist, consists of eight small irregular bones, arranged in two rows, united by ligaments, and lying between the forearm and the palm. (4) The *metacarpus*, or palm, includes the five metacarpal bones, numbered from the thumb to the little finger. The fingers, or *digits*, are provided with three bones each, except the thumb, which has only two. These bones are known as the *phalanges*. The thumb has the advantage of moving freely on the carpus, by means of a saddle joint. The other carpal and metacarpal bones move upon one another by means of gliding joints.

The *pelvic girdle* comprises the innominate, or hip bones, immovably united to the sacrum. Each *innominate* is composed of three bones (ilium, ischium and os pubis), which unite in adult life along a Y-shaped line, located in the cup of the hip joint. The *ilium* spreads out a broad concave surface, in which the intestines are supported; the *ischium*, or haunch bone, forms the projection of the buttock and supports the body while sitting; the *pelvis*, or basin, furnishes the bony support upon which rest the organs of the lower abdominal cavity.

The lower extremities join the innominate bones in the hip joints. They include, on each side, the femur, the patella, the leg and the foot. (1) The *femur*, or thigh bone, is the longest bone in the body; at the upper end of the shaft is a head, a neck, an angle and a large and a small projection; at the lower end are two knobs (external and internal), articulating with the tibia and the fibula in the knee joint. (2) the *patella*, or kneecap, is a chestnut-shaped bone, placed in the tendon of the muscle, at the point where the tendon glides over the external surface of the femur. (3) The *leg* contains two bones, the *tibia*, or shin bone, and the *fibula*. The tibia is the larger bone and articulates with the femur. At the lower extremity is a horizontal, smooth surface, for articulation with the ankle. The fibula is a slender bone, located on the outside of the leg, covered entirely by muscles, except at



THE SKELETON

- 1. Cranium. 2. Vertebrae. 3. Ribs. 4. Scapula or shoulder blade. 5. Clavicle or collar bone. 6. Hip bone. 7. Coccyx. 8. Pubes. 9. Sacrum. 10. Femur or thigh bone. 11. Patella or kneecap. 12. Tibia. 13. Fibula. 14. Metatarsal bones. 15. Phalanges. 16. Sternum. 17. Humerus. 18. Ulna. 19. Radius. 20. Phalanges. 21. Metacarpal bones.

the carpus and the metacarpus. (1) At the upper extremity of the *humerus*, or arm bone, are found a head, a neck and two projections, while at its lower extremity it articulates with the ulna and radius. (2) The *forearm* is made up of the *radius* and the *ulna*, the former on the outside and the

its upper and lower extremities. It articulates above and below with the tibia. (4) The *foot* is made up of a series of bones, arranged in three groups—the *tarsus*, or ankle, made up of seven bones; the *metatarsus*, made up of five metatarsal bones, and five digits, in each of which are found three bones, except in the great toe, which contains only two.

The articulation of the bony parts into a symmetrical, graceful whole, capable of united movement, is one of the marvels of nature. Every mechanical device known to man has its prototype in the bodily structure. See **JOINTS**.

SKEPTICISM, *skep'te siz'm*, a term in philosophy applied to a trend of reasoning in which the predominant attitude is doubt. Notable among the skeptics of the ancient world were Gorgias, Protagoras, Pyrrho and Timon. With the Renaissance the influence of this philosophy is apparent in the writings of Montaigne, Sanchez and Charron. Kant and Spencer were skeptics with regard to ultimate reality. In David Hume, modern skepticism had its foremost adherent.

SKI, *ske*, or **SKEE**, the Scandinavian snowshoe, consisting of a runner, or slat, of wood, six to ten feet long, about one-fourth of an inch thick and a little broader than a man's foot. It is slightly curved upward at the tip, and sometimes has a narrow groove along the middle of the lower surface, to keep it from slipping sideways. Skiing is great sport, and in Norway, Canada and the United States clubs compete every winter. In walking uphill a zigzag course is followed; the downhill motion is a swift slide, steered by means of a shaft. A jump is made on a hillside and is really a long flight through the air, from which the jumper is expected to alight on his feet and continue his course without falling. The infantry of Sweden and Norway is equipped with skis for long marches.

SKIMMER. See **SCISSORSBILL**.

SKIN, THE, the outer covering of the body, It has a total area of from twelve to twenty square feet and varies in thickness from one-eighth to one-hundredth of an inch, according to location.

Structure. The skin is composed of two layers. The outer, the *epidermis*, or *cuticle*, is itself made up of several layers of cells of various shapes and sizes. The surface layer is composed of horny scales and is thick-

ened on the palms of the hands and on the soles of the feet. The inmost layer of the cuticle seldom varies in thickness, and it fits closely to the true skin. It contains the coloring matter which gives the characteristic tint to individuals and races. There is at all times a continual building of new cells and a throwing off of old ones from the surface. The hair and nails are a modification of the cuticle.

The true skin, the *dermis*, or *cutis*, in its outer layer contains many minute projections, called *papillae*, upon which the inmost layer of the cuticle is molded. They are most abundant where the sense of touch is most acute, as they contain nerve fibers.

Glands. The skin also contains the *sudoriferous*, or *sweat glands*, and the *sebaceous glands*. The former, consisting of small, round masses, surrounded by blood vessels in the fat tissue under the skin, send up a duct through the cutis to the surface of the body, where it pours its secretion through a slanting, valvelike opening. These glands are distributed over the whole surface of the body, but are most abundant and largest in the palm of the hand, on the sole of the foot, and on the brow. Sebaceous glands, abundant in those parts of the body supplied with hair and about the entrances to the body, as the nose, the lips and the external ear, are wholly wanting in the palms of the hands and the soles of the feet. Their secretion keeps the skin soft and pliable.

The skin serves as an organ of touch; a regulator of temperature, by the evaporation of the sweat that is always being poured to the surface of the body; a protection for the deeper tissues, and an organ of excretion, secretion and absorption.

Related Articles. Consult the following titles for additional information:

Baths	Nails
Glands	Nervous System
Hair	Perspiration
Hygiene	

SKIN GRAFTING, or **AUTOPLASTY**, *aw'toh plas ti*, a surgical operation sometimes used in the treatment of sores or ulcers that are slow in healing. Small pieces of healthy skin, cut from other parts of the patient's body, or from the body of another person, are placed upon the raw sore. The skin particles gradually grow over the unhealed surface, in time effecting a cure.

SKINK, a small lizard native to the sandy deserts of North Africa and Southwestern Asia. Skinks are from six to eight inches

long, are reddish in color, banded with darker shades, and their bodies are entirely covered with rounded scales. One species, the *adda*, is celebrated throughout the East as being useful in the cure of various diseases to which the inhabitants of Egypt, Arabia and other Eastern countries are subject.

SKINNER, *skin'er*, OTIS (1858-), an American actor famed as an interpreter of character and romantic rôles wherein buoyancy and flashes of humor are blended. He was born at Cambridge, Mass. His early training was gained under the tutelage of Edwin Booth and Lawrence Barrett. From 1884 to 1889 he was a member of the Augustin Daly company and later for several seasons appeared as leading man for Modjeska. His last successes before his retirement included. *The Harvester*, *Kismet*, *Cock o' the Walk* and *Mr. Antonio*.

SKUA, *sku'a*, a powerful bird of prey of the gull family, living on northern seacoasts, and having brown and white plumage and a strong, hooked beak. The Arctic and Antarctic species attack terns and small gulls, taking from them the fish they have caught; they also devour smaller birds.

SKULL. See SKELETON.

SKUNK, a fur-bearing animal of the weasel family, found from Northern Canada to Patagonia in the American continents. The



SKUNK

animal is about the size of a large cat, has feet and claws like a badger's and a tail like a squirrel's. The fur is brown, streaked longitudinally with black and white. Skunks are notorious for a malodorous fluid which they eject as a means of defense, driving away their most aggressive enemies. They are sluggish ground animals, living in burrows and prowling usually at night, but occasionally in the daytime. They sometimes raid poultry yards, but so great is their service to the farmer as destroyers of mice, snakes and harmful insects and grubs that more than a dozen states have passed laws to protect

them. They are also valuable as producers of fur, which is often sold under the name "Alaska sable."

SKYE, *ski*, ISLE OF, an island of the Hebrides group, off the west coast of Scotland, forming part of the County of Inverness. It is the second in size of the Scottish islands, having an area of 535 square miles. Although it has some tillable land, Skye is largely mountain and moor; a land of rugged scenery and weird legend. Some of its lochs and glens are famous for picturesqueness—Loch Coiruisg, immortalized by Sir Walter Scott in his *Lord of the Isles*, and Glen Sligachan, at the head of the loch of the same name. The highest mountains are the Coolin Hills, in the south. The coasts of the island are deeply indented and the waters abound in cod, herring, ling and saithe. A fringe of fishing villages lines the coasts. Sheep raising is the chief occupation of the farmers, and much wool and sheep as well as fish goes through Portree, the principal port, which has a population of about 3,000, about one-fifth of the entire population of the island. To many persons the name *skye* is chiefly identified with a popular breed of pet dogs which are native to the island.

SKYE TERRIER, *ski ter'i er*, a small terrier native to Scotland, taking its name from the Isle of Skye. It is from eight to ten inches high, and has a long body and short legs. The hair, which may be sand-colored, gray or black, reaches to the ground, and on the forehead completely covers the eyes. The skyes, like most other terriers, are good rat dogs.

SKYLARK. See LARK.

SLAG, a compound formed in the processes of extracting metals from their ores. It is mainly a compound of silica with alumina or lime, or both, together with various other substances in small quantity. It always contains more or less of the metal from the extraction of which it results. The presence of silica gives a glassy appearance to the mass. Slag is sometimes cast into blocks and used for road making and building, and when reduced to powder it is used in making mortar. In some parts of Europe slag is employed to impart a glaze to bricks. Some kinds of iron slag are made into an imperfect glass, which is used for vases and other small articles.

SLAN'DER, false and malicious oral defamation of a person, which has a tendency

to injure his reputation. It is distinguished from *libel*, which is written or printed defamation of character. Aspersions spoken to a person are not deemed slander, because they are not injurious to reputation; but when spoken in the hearing of a third person, the law holds them actionable. If the words spoken are true and justifiable, no action can be successful. A statement which is not in itself actionable may by the court be held to be so if it was used and understood in a particular derogatory sense. An accusation of perjury is always actionable. Certain kinds of communication are regarded as conditionally privileged, as in the case of an employer who communicates to one who has a right to know particulars regarding one of his former employes. However, exemption from liability in such a case does not imply a right to express malicious slanderous opinions.

SLANG, inelegant and unauthorized language, including sporting and trade jargon, standard expressions used with some other than their correct meaning, and words of dubious origin. While certain slang expressions may be traced to the speech of illiterate or even outlaw classes, others are used by educated persons for the purpose of giving force and piquancy to their language. Slang is not ordinarily used in dignified writing, but it is common in a certain type of humorous literature. The everyday speech of the average person is more or less tinged with slang. The university student "crams" for his final examinations; the football enthusiast speaks of "booting the pigskin;" the actor about to receive his pay check is waiting for the "ghost to walk;" the artist complains that the committee "skied" his picture, and so on. In many cases slang is based on comparison, that is, on metaphor. Such expressions as "to cash in," "to go fifty-fifty," "to bring home the bacon," are really vulgarized figures of speech.

Like many other irregularities in language, slang expressions have their good and their bad points. They are an inevitable part of the growth of a language, and it often happens that a word introduced as slang becomes in time standardized. Such, for example, is true of *skyscraper*, *tandem*, *blizzard* and *gerrymander*. As has been suggested, slang sometimes gives variety and force to language, in the same way that figurative expressions are useful. Slang expressions,

however, must always be used with discretion. Vulgarities of speech should be avoided, and one should be careful about overloading the speech with slang phrases, no matter how expressive. The habitual and indiscriminate use of these expressions tends to cheapen the conversation, limit the vocabulary and deaden one's taste for the language of culture.

SLATE, a well-known hard variety of rock, which splits into thin plates, used for making school blackboards and slates and for roofing. While the prevailing color is gray of various shades, slate may be green, purple, red or black. It yields to the knife, but the different varieties vary in hardness. Slate occurs in all countries where there are metamorphic rocks. It is commonly divided into elevated beds of various degrees of thickness; and from the natural divisions of the rock these beds often form peaked and serrated mountains. The finest variety, which is used for the covering of roofs, is generally embedded in other slate rocks, of a coarser kind. Quarries of slate of this description are worked extensively in Vermont and Pennsylvania, and on a smaller scale in Maine and Virginia. The finest grades are used for writing slates and blackboards. In the making of marbleized slate, the background is painted on the stone, which is allowed to dry and is then dipped into water, upon which coloring matter has been spread. The coloring matter adheres to the slate and thus produces the pattern, which is fixed by baking the slabs in a kiln.

SLAVERY, the system by which persons are held as the property of others. Slavery existed among the Hebrews, but in a very restricted form. Among the Greeks and Romans it was a rooted institution, its character of mildness or severity varying in different times and places. The slaves of the ancient Romans were either captives or debtors unable to pay. Originally they had no rights at all, and could be put to death for the smallest misdemeanor. Slaves were exceedingly numerous, and in later times almost monopolized the handicrafts and occupations, those of clerk, doctor and literary man included. Hosts of slaves were employed in the gladiatorial exhibitions. In Rome slaves were often set at liberty, and they sometimes won renown, as in the cases of Terence and Epictetus, but it was not until the time of the Empire that any important change took place

in the institution itself. Emperor Augustus granted the slave a legal status, and Antoninus took from the masters the power of life and death over their slaves.

The rise of Christianity modified the rigid chattel conception of the slave, and, accordingly, the law soon gave him personality and protection. Finally, Justinian, in the sixth century A. D., enlarged the *coloni*, men personally free, but tied to the soil like serfs. Thereafter slavery, though practiced by Rome's Teuton conquerors, was gradually replaced in medieval Europe by feudal vassalage, or serfdom. This persisted to modern times, surviving in Russia until 1861.

Modern Revival of the Slave Traffic. After the institution had become all but extinct in Europe, it had a new birth in the American colonies of European origin. The first shipment of negroes to the New World took place in 1503, when the Portuguese carried some to Santo Domingo. From that time a traffic in negroes across the Atlantic was carried on by all the colonial powers, the English being particularly active.

Slavery soon affected the social, economic, and political character of the colonies, especially in the South, where it was found profitable, to such an extent that in spite of the theory of equality then in vogue, abolition was deemed unwise and unnecessary by the majority of the people.

Denmark was the first nation to decree the end of the slave trade, in 1792, although the movement was started by the American Quakers in 1696 and their English brethren in 1729. Through the efforts of Thomas Clarkson and William Wilberforce, the House of Commons passed a bill against the traffic in 1792, but the House of Lords did not approve the measure until 1808, in the same month that the United States legislated against the further importation of Africans. On February 4, 1794, the French National Convention declared all the slaves in the French colonies free. The abolition of the slave trade by most of the other European powers was gradually provided for by treaty. These treaties were mainly enforced by a British squadron maintained off the west coast of Africa. In 1831 the British government emancipated all the slaves of the Crown, and in 1833 a bill was passed for the emancipation of all the slaves in British colonies. By this bill the slaves were to receive their freedom on August 1, 1834, and the sum of

\$100,000,000 was to be distributed as a gift among the slaveholders, to compensate for any loss they might sustain by the arrangement.

The United States Constitution provided for the abolition of the slave trade in 1808, but a struggle was waged against slavery itself for a half-century thereafter. It culminated in the Civil War, as a result of which abolition was declared by proclamation in 1863 and by Constitutional amendment in 1865. In 1873 the Spanish government abolished slavery in Porto Rico; and in 1886 abolition in Cuba took place. Slavery existed in Brazil until 1888. The efforts made to suppress the slave trade on the east coast of Africa have not proved quite successful and a trade is still being carried on in Africa, although not on an extensive scale.

Related Articles. Consult the following titles for additional information:

Abolitionists	Kansas-Nebraska
Brown, John	Bill
Calhoun, John C.	Lincoln, Abraham
Civil War	Mason and Dixon's
Clay, Henry	Line
Compromise of 1850	Missouri Compromise
Crittenden Compro-	Phillips, Wendell
mise	Political Parties in
Dred Scott Decision	the United States
Emancipation	Reconstruction
Proclamation	Squatter Sovereignty
Feudal System	Serfs
Fugitive Slave Laws	Underground Railroad
Garrison, William	Wilberforce, William
Lloyd	Wilmot Proviso

SLAVONIA. See CROATIA AND SLAVONIA.

SLAVS, *slahvz*, a branch of the Aryan, or Indo-Germanic, family, constituting the greater portion of the population of Russia, Central Europe east of Germany, and Siberia. They include Russians, Poles, Czechs, or Bohemians, Slovaks, Slovenians, Serbs, Croats, Montenegrins and Bulgarians, and number about 180,000,000. In stature the Slavs are a little below the average Aryan, and they have broad heads. Their skin is swarthy, light brown or pale white; their eyes, brown, gray or black. Representing a civilization not advanced to full maturity, the Slavs were stirred to great revolutionary upheavals during the World War. In Russia the imperial government was overthrown, and an attempt was made to establish a communistic republic. In the Slavic portions of the Austro-Hungarian monarchy two independent states were erected, the Czecho-Slovak (Bohemian, Moravian, Slovak), and the Jugo-Slavic, or Southern Slavic.

Related Articles. Consult the following titles for additional information:

Austria-Hungary	Bohemia
Balkan Wars	Bosnia

Bulgaria	Poland
Croatia and Slavonia	Russia
Czech	Serbia
Czecho-Slovak	Slovaks
Republic	Slovenians
Jugo-Slavia	World War
Montenegro	

SLEEP, the state of repose or quiescence during which the body restores its worn-out cells and the mind is rested and renewed. Unconsciousness is complete or partial; the body is relaxed and the vital functions are at a low ebb. Sleep is periodical, a certain number of hours out of each twenty-four being necessary to physical and mental well-being. Night hours are best adapted to sleep, and daytime sleep is never as refreshing as that taken in the natural darkness. Sleep is also rhythmical, being deepest the second hour and becoming lighter as the end of the sleep period approaches.

Much study has been put upon the physiological causes of sleep, different theories attributing it (1) to the pressure of congestion on the brain and nerve centers, or quite to the contrary; (2) to a lack of blood in these centers; (3) to the presence in the system of the by-products of combustion and (4) to the dissociation, under conditions of fatigue, of the neurones, or nerve cells. None of these theories entirely accounts for sleep, and it is probably true that it has a combination of physiological causes.

The regularity and conditions of sleep have a marked effect on the health, especially on that of growing children. Babies sleep most of the time; children below twelve should have twelve hours of sleep; few adults are at their best on fewer than eight hours. Sleeping rooms should be sanitary, open to the sunlight during the day and well ventilated at night. Open-air sleeping is growing in favor, and the sheltered, screened-in sleeping porch forms a part of many modern houses and living apartments. The best bed for sleep is one with wire springs, a mattress of hair or felt, and warm, lightweight wool or cotton coverings.

SLEEPING SICKNESS, an incurable disease not uncommon in equatorial Africa. It is caused by a parasite communicated to man by the bite of the tsetse fly (which see). It is always fatal. In recent years whole sections in Africa have been depopulated by its ravages. The sleeping sickness stage begins when the disease reaches the nervous system. The patient becomes apathetic, the apathy deepens into stupor, and he literally sleeps himself to death.

SLEEPWALKING. See SOMNAMBULISM.

SLIDELL, *sli del'*, JOHN (1793-1871), an American politician, born in New York City and educated at Columbia College. He removed to New Orleans in 1819, and eventually became United States district attorney for Louisiana. In 1853 he was elected to the United States Senate, but resigned upon the secession of Louisiana. Later he was appointed special commissioner of the Confederate States to France and ran the blockade of Charleston, S. C. He was captured with James M. Mason, however, while aboard the British steamer *Trent*, and was arrested and taken to Fort Warren, Boston. Upon his release he sailed for England, where he took up his interrupted negotiations with foreign governments, but without success. At the close of the war he settled in London, where he died. See TRENT AFFAIR.

SLIME MOLDS, a group of minute plants of exceedingly simple structure, which live upon rotting bark and decaying wood, in moist, shady places. They are not easily distinguished from animals; in fact, they have been thus described. In no other plant is protoplasm found in such large quantity. During one period of its life the slime mold develops spores which, when dry, retain life for an indefinite period; but as soon as moistened, they swell quickly, burst and discharge their protoplasm. This protoplasm lengthens and develops a delicate hair at one end, by means of which it swims about freely. The form modifies until it resembles an amoeba (which see). Then many of the plants unite and make the slimy plasmodium, which slides about over decaying vegetable matter until ready again to produce spores and repeat the circle of its life. The largest plasmodia may be several inches square, although most of them are much smaller.

SLING, a simple little device of very ancient origin, used for throwing stones or bullets. One kind consists of a strap, with two strings attached to it. The stone or bullet is lodged in the strap, and the sling is whirled rapidly round in a circle, the ends of the strings being held in the hand. The missile is thrown when one of the strings is allowed to fly loose. The velocity with which the projectile is discharged is the same as that with which it is whirled round in a circle whose radius is the length of the string. The sling was a very general instrument of war among the ancients.

Another kind consists of a Y-shaped stick, to each fork of which is attached an end of a thick rubber band. The stick is held in one hand, and with the other a stone is held against the elastic, which when stretched backward and then released throws the stone with much force. The catapult, or slingshot, may be a dangerous weapon, and in most cities boys are forbidden to use it. A sling used by the Paraguay Indians, the Patagonians and the Gauchos of Argentina, called a *balas*, consists of a rope which has, at each end, a heavy stone, or bullet, of metal or hardened clay. It is thrown so as to entangle the legs of the animal at which it is aimed.

SLIPPERWORT. See CALCEOLARIA.

SLOE, *slo*, a spiny, many-branched shrub or small tree of the plum family, possessing a very hard, tough wood, found in Europe and Asia, on the mountains in the southern and eastern parts of the United States and in South-eastern Canada. Its black, round fruit, about the size of a pea, is used for preserves and liquors. The



SLOE BRANCH AND FRUIT

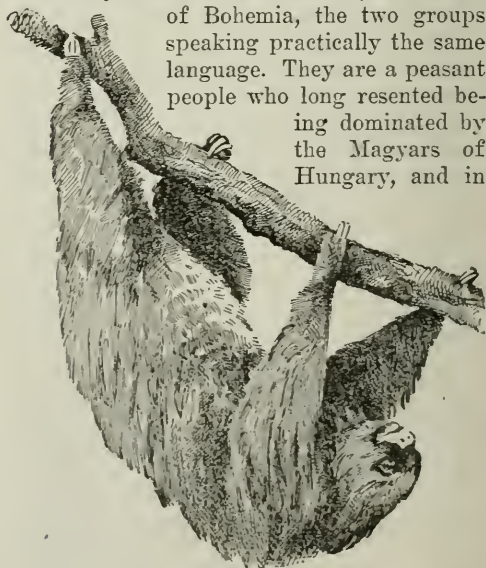
juice is much used in the manufacture of a spurious port wine.

SLOTH, a mammal inhabiting South and Central America. The claws of the sloth are long and curved, the feet are turned inward. This adaptation is of great service to the animal in its life in the trees, but it makes walking on the ground almost impossible. The sloths live on the leaves, buds, and barks of trees. The best known species is the *ai*, which has three toes and is of a brownish-gray color, with darker tints on the face and limbs. The fur is very coarse. The *unau*, or *two-toed sloth*, has an average length of about two feet, and its color is a lighter gray than that of the *ai*. The tail in both species is usually lacking, or is of a rudimentary character.

SLOT MACHINE, the name given to two kinds of automatic devices, one of which is used for legitimate purposes of trade, the other for gambling. They are alike only in that the mechanism in each is set in motion by a coin dropped in a slot. The first is a sort of "automatic salesman." It may contain an assortment of chewing gum, candy, peanuts or cigars, the name of the brands or flavors being indicated above a series of levers; and the purchaser after dropping his coin presses the lever according to his choice. Another slot machine is used to release gas for household use; still another supplies telephone service. In 1916 automatic restaurants were opened; these serve food enclosed in little wall compartments behind small doors operating on the slot machine principle.

The slot machine used in gambling consists of a wheel divided radially into sections. The bettor stakes on a particular section and drops in his coin, which starts the wheel revolving. If the wheel stops with pointer indicating the section on which he has staked, he wins. The chances against winning are at least 60 to 40, and very frequently less.

SLOVAKS, a Slavic people found chiefly in Moravia and Slovakia, former territories of the Austro-Hungarian monarchy. The Slovaks, who number more than 2,500,000, are closely related to the Czechs (see CZECH) of Bohemia, the two groups speaking practically the same language. They are a peasant people who long resented being dominated by the Magyars of Hungary, and in



SLOTH

1918 they joined their kinsmen in Bohemia in setting up the Czecho-Slovak Republic.

SLOVENIANS, *slo ve'ni anz*, a South Slavic people inhabiting portions of the old Austro-Hungarian monarchy. They are found in Carniola, Southern Carinthia, Styria and various districts north of the Adriatic Sea. They number over 1,500,000. The Slovenians constitute one group of the Jugo-Slavic peoples, who united in 1918 to form a new state. See JUGO-SLAVIA; WORLD WAR.

SLOYD, *sloid*, a system of manual training, originating in Sweden and quite generally adopted in other countries. The Swedish word *slog*, in its English form *sloyd*, means *skill of hand*. The original plan limited the work to the manufacture, by whittling, of small household utensils, such as wooden spoons, knives and forks. In 1876, Otto Solomon, director of the normal school at Naas, extended the system by the introduction of mechanical drawing, extended the use of tools, and adapted more difficult exercises.

The system in vogue in the United States and Canada is patterned after Solomon's idea and constitutes the foundation of most of the manual training work for boys in elementary schools. The material used is wood, cardboard or iron. A special line of instruction is prepared for each class of material. See MANUAL TRAINING.

SLUG, the name applied to several genera of mollusks, resembling the snails but lacking an external shell, although many of them possess a rudimentary organ of this nature concealed more or less completely by the mantle. The slugs have four tentacles, and the eyes are borne on the tips of the larger pair. The *great gray slug*, introduced from Europe into the United States and Canada, usually frequents hollow trees and undisturbed heaps of vegetation. The *giant yellow slug* of California and the *black slug* are other species. See SNAIL.

SMALLPOX, or **VARIO'LA**, an acute, infectious disease, characterized by an eruption with papular, vesicular and pustular stages, followed by crusting. It has been known and described since the early Middle Ages, and at times has been one of the most terrible of scourges. No infant is too young to take the disease, and no adult is too aged. The contagion lies in the sores, or *pustules*, and it is also probably given off through the breath and the pores of the skin. The disease manifests itself about twelve days after

exposure and varies in duration according to the severity of the attack. In minor cases the recovery is rapid and complete, but in severe cases death may intervene quickly. Unless great care is exercised during the disease and after, the patient may be left with bad scars or with serious affection of some of the organs, particularly of the eyes.

In 1780 the English surgeon, Jenner, discovered the method of preventing smallpox by vaccination and since that time it has been demonstrated that the disease may be practically stamped out by the vaccination of the whole population. Exposure to the disease should be followed by immediate vaccination, unless this has been recently done. See VACCINATION.

SMELL. The sense of smell originates in the olfactory lobes of the brain, and the olfactory nerves coming from these centers are distributed to the mucous membrane of the upper part of the nasal cavities. In order that odors may be detected, air must pass through the nostrils; hence a person sniffs when he desires to scent an odor more keenly. The sense of smell in man is not nearly so keen as in many of the lower animals, though he can probably detect more odors than any of these animals.

Odors are numerous and difficult to classify, and they are named from the substance from which they arise, as the odor of musk and the perfume of violets. The nerves of smell are stimulated by an odor when it first acts upon them, but if long continued, this is lost, and the person fails to recognize it at all.

The nature of odor is not well understood. That it arises from gaseous or volatile matter all agree, and some authorities consider that it can arise from matter in a gaseous state alone; others disagree, and in support of their theory point to the fact that substances like musk can fill a large space with odor for weeks and not diminish perceptibly in weight. The sense of smell is closely allied to the sense of taste, which it undoubtedly aids.

Related Articles. Consult the following titles for additional information:

Nose	Special Senses
Perfumes	Taste

SMELLING SALTS, a preparation of ammonium carbonate, usually scented with lavender, sometimes with bergamot, used as a stimulant and restorative in cases of faintness. It is put up in small, fancy bottles

which may easily be carried in a pocket or handbag, and proves most useful in emergencies.

SMELT a family of fishes allied to the salmon. They are slender and delicate and usually measure about eight inches in length. They receive their name because of their odor, which is like that of a cucumber. Smelts live off the coasts of Europe and North America. In the United States they abound along the New England and the California coasts. In Scotland they are called *sparling*. Their use as food is steadily growing.

SMETANA, *sme tah'nah*, FRIEDRICH (1824-1884) a Bohemian composer and pianist, the founder of the Bohemian school of composition. He founded a musical academy at Prague, after studying under Liszt, but went to Sweden in 1856 and became conductor of the Gothenburg Philharmonic concerts. There he remained until 1866, when he became kapellmeister at the National Bohemian Theatre. In his later years, his mind gave way, and he died in the Prague lunatic asylum. Smetana's works have a true Bohemian atmosphere; they are thoroughly original and contain not a few passages of striking power and beauty. He composed several operas, *The Bartered Bride*, *Two Widows*, *Dalibor* and others, besides many compositions for the piano and orchestra.

SMILAX, a group of plants belonging to the lily family. Most of them are climbing or trailing, and numerous species are found in Asia and America. Sarsaparilla is obtained from the roots of several species, and the roots of others are edible. The species known as green brier and the carrion flower are found in the United States. The cultivated plant known to gardeners as smilax is really an asparagus.

SMILES, SAMUEL (1812-1904), an English writer, born at Haddington, Scotland, and educated for the medical profession. He practiced for some time as a surgeon at Haddington and at Leeds, and then became editor of the *Leeds Times*. He is the author of many works on industrial enterprises, the chief of which are *Life of George Stephenson*, *Workmen's Earnings, Strikes and Wages* and *Lives of the Engineers*. His inspirational books, *Self-Help*, *Character, Duty and Thrift*, have had a wide popularity, the first especially, having been translated into seventeen languages. These works are characterized by their clear and simple style.

SMITH, ADAM (1723-1790), a British economist, founder of the science of political economy, was born at Kirkealdy, Scotland. He attended the universities of Glasgow and Oxford, afterwards lectured on literature and philosophy, and for twelve years occupied the chair of logic and ethics at the University of Glasgow. His great work, *The Wealth of Nations*, the first systematic treatise on economics, appeared in 1776. This admirable book, based on statistics and original research rather than on speculation, set a new standard for publications in this field; and in encouraging investigation along similar lines it was an inspiration to all later students of economic subjects.

SMITH, EDMUND KIRBY (1824-1893), an American soldier, born at Saint Augustine, Fla., and educated at West Point. He served in the Mexican War with distinction and later became an instructor at West Point. At the opening of the Civil War he resigned from the United States army and became brigadier-general in the Confederate service, serving with Johnston in the Shenandoah Valley in 1861 and under Bragg in the west in the following year. In October, 1862, he was made lieutenant-general and was given charge of all the Confederate forces west of the Mississippi. In February, 1864, he was made general and opposed General Banks in the disastrous expedition up the Red River. He finally surrendered to General Canby, in May, 1865. After the war he became interested in commercial enterprises, was chancellor of the University of Nashville from 1870 to 1875 and later professor in the University of the South at Sewanee, Tenn.

SMITH, FRANCIS HOPKINSON (1838-1915), an American engineer, artist and author, born at Baltimore, Md. In his work as engineer he became also a successful contractor and constructed several important government works on the Atlantic seaboard, among them the Race Rock lighthouse. As an artist he became known through illustrations he made for his magazine articles and his water colors and charcoal sketches. His pictures have been given place in numerous large public collections. He wrote a number of novels, probably the best of which is *Colonel Carter of Cartersville*. Among his other books are *Caleb West*, *A White Umbrella in Mexico*, *the Fortunes of Oliver Horn*, *The Under Dog*, *Tides of Barnegat*, *Peter*, *Forty Minutes Late* and *Kennedy Square*.

SMITH, GOLDWIN (1823-1910), an eminent publicist, historian and educator, born at Reading, Berkshire, England. He was educated at Eton and at Oxford (was called to the bar, though he never practiced), and became professor of modern history at the latter university. He lectured in the United States in 1864, and two years afterwards was offered a professorship in English and constitutional history at Cornell University. He remained there three years, then became a resident of Toronto, Ont., where he founded *The Canadian Monthly*, *The Nation* and *The Week*. Smith was widely read because of his sound knowledge and lucid style. Of his historical writings, representative volumes are *A Short History of England Down to the Reformation* and *Irish History and the Irish Question*. His other writings, which were numerous and covered a wide field, include *Labor and Capital*, *Guesses at the Riddle of Existence*, *My Memory of Gladstone* and *In Quest of Light*.



GOLDWIN SMITH

SMITH, JOHN (1580-1631), commonly known as Captain John Smith, one of the founders of the English colony in Virginia, born at Willoughby, in Lincolnshire. After many adventures as a soldier of fortune in Europe, Asia and Africa, he went out with the first expedition of the London Company to America in 1606. Dissensions broke out before the destination was reached, and Smith was condemned to be hanged; but he escaped this fate and became the most influential member of the colony. He made important geographical discoveries, obtained supplies from the natives and finally was entrusted with the guidance of the colony. In this task he displayed notable executive ability. In 1609, according to his account, he was captured by Powhatan, and was saved by Pocahontas from being killed. In the same year he was injured by an explosion of gunpowder, and shortly afterwards he returned to England. Five years later he reached America again and explored the coast of New England. He wrote *A True Relation of Virginia*, *The*

Summer Isles and *Description of New England*—books of real historical and geographical value.

SMITH, JOSEPH (1805-1844), the founder of the Church of the Latter Day Saints, or the Mormons, was born in Sharon, Vt. He moved with his parents to Palmyra, N. Y., when he was ten years old. At the age of twenty-two he announced that in a vision an angel had revealed to him the spot where the Bible of the western continent was buried. Following the directions thus obtained, Smith claimed that there was delivered to him the volume containing the doctrine on which Mormonism is founded. The new sect met with persecution and the Mormons were gradually driven westward. In 1844 Smith was arrested for alleged violations of the law, and lodged in jail at Carthage, Ill., where he was shot by a mob. See MORMONS.



JOSEPH SMITH

SMITH, SAMUEL FRANCIS (1809-1895), an American preacher and hymn writer, best known as the author of the national anthem beginning, "My Country, 'Tis of Thee." He was born in Boston, Mass., and was graduated from Harvard College in 1829 and from Andover Theological Seminary in 1832. He was pastor of the Baptist Church, Waterville, Mo., and subsequently became professor of modern languages in Waterville College. Later he was pastor at Newton, Mass.; editor of the *Christian Review*, Boston, and editor of the publications of the Baptist Missionary Union (1854-1869). He wrote, in addition to poems, *Life of Rev. Joseph Grafton*, *Missionary Sketches*, *A History of Newton* (Mass.) and *Rambles on Mission Fields*. See AMERICA.

SMITH, SYDNEY (1771-1845), an English humorist, born at Woodford, Essex. He was graduated at New College, Oxford, and was ordained in the established church. Moving to Edinburgh in 1798, he helped to found the *Edinburgh Review*, to which he made frequent contributions in later years. In 1803 he moved to London, where he gained note as a preacher, writer and lectur-

er. He was gradually promoted in the church, until in 1831 he was appointed a canon in Saint Paul's Cathedral. His principal writings are his *Letters on the Subject of the Catholics, to My Brother Abraham, who Lives in the Country, by Peter Plymley*, a satirical essay in the interests of Catholic emancipation. These and other less famous writings abound in logic and good humor.

SMITH COLLEGE, an institution for the higher education of women, founded by Miss Sophia Smith at Northampton, Mass. It was chartered in 1871 and class sessions began in 1875. All undergraduate courses of study lead to the degree of Bachelor of Arts. The degree of Master of Arts is conferred for postgraduate work. Among the college buildings are the library, containing over 60,000 books, an observatory, a conservatory, an art gallery and a spacious auditorium. The faculty numbers about 185, and there are over 1,950 students. The college is a contributor to the American Schools of Classical Study at Rome and Athens, to the marine biological laboratory at Woods Hole, Mass., and to the zoological station at Naples.

SMITH-HUGHES ACT. See HIGH SCHOOL, subhead *Smith-Hughes Act*.

SMITH'S FALLS, ONT., in Lanark County, on the Rideau Canal and the Canadian Pacific and Canadian Northern railroads, forty-five miles south of Ottawa. A large agricultural implement factory is located here; there are also stove factories, woolen, flour and planing mills. The town has a collegiate institute, two hospitals, a town hall, a library and a market. Population, 1916, about 7,000.

SMITHSONIAN INSTITUTION, an institution created by an act of Congress in 1846, to carry into effect the provisions of the will of James Smithson, an Englishman, who, in 1826, bequeathed \$515,000 to the United States to found at Washington an establishment for the "increase and diffusion of knowledge among men." The institution is governed by a board of regents, consisting of the Vice-President of the United States, the Chief Justice of the Supreme Court, three members of the Senate, three members of the House of Representatives and six citizens of the United States appointed by joint resolution of Congress. Its executive officer is the secretary, chosen by the regents.

The first secretary, Professor Joseph Henry, outlined the scope and administrative

policy of the Institution, and to his wisdom and foresight the efficiency of the institution is largely due. The aim is to encourage original research in science and literature and to diffuse knowledge by publishing reports of investigations, thereby helping to bring about a free interchange of ideas among scholars throughout the world. To the original bequest of Smithson have been added other donations and bequests; the total income is now approximately \$1,000,000.

The three series of publications systematically issued are *Contributions to Knowledge*, *Miscellaneous Collections* and *Annual Reports*. These are distributed free of charge to public libraries, educational institutions and individuals engaged in literary or scientific research. In connection with this distribution the Institution has established a system of international exchanges, so that it obtains similar publications from nearly all countries of the world.

In addition to the work of the Institution proper, the secretary has charge of the National Museum, which is maintained by the government; also of the Bureau of Ethnology, which is a department in the Institution, of the Astrophysical Observatory and of the National Zoological Park. The Institution occupies beautiful buildings on the Mall, extending from the Capitol to the Washington Monument. Here are found the original buildings of the Institution and the National Museum, while the Bureau of Ethnology occupies rented quarters in another part of the city, and the Zoological Park is about two miles north. See NATIONAL MUSEUM OF THE UNITED STATES.

James Smithson (1765-1829), founder of the Smithsonian Institution, was the son of Hugh Smithson, first Duke of Northumberland. He was educated at Pembroke and Oxford and was a fellow in the Royal Society. By his will he left to his nephew about \$515,000, stipulating that if the legatee died without issue, the whole amount should pass to the United States, to found at Washington an institution to be called the "Smithsonian Institution," and to be conducted for the advancement of learning. Strangely, this benefactor of the United States never crossed the Atlantic Ocean; he favored a land he knew only by reputation.

SMOKE, the visible vapor which rises from burning substances. In its more extended sense the word is applied to all the

volatile products of combustion, including soot; but the term is frequently applied to merely the carbonaceous matter which is held in suspension by the gases. Smoke from the many furnaces of a large city often becomes a public nuisance, and in many places laws have been passed requiring the adoption of some device for burning the soot, but no one method has been found successful in all cases. There are many practical difficulties in the way of consuming smoke, but experience has shown that none of them are impossible to overcome. If sufficient air is supplied to furnish oxygen, the combustible parts of smoke can be made to burn and leave only invisible vapors and gases.

In recent years the shortage of anthracite coal and the necessity of using soft coal for domestic purposes has resulted in a general smoke evil in the United States. The resulting damage is inestimable.

SMOKELESS POWDER, a powerful explosive, is made by combining some form of cellulose (wood fiber) with a mixture of sulphuric and nitric acids and then adding acetic acid or acetone. The smokeless powder most extensively used is made by kneading guncotton (which see) into a paste with acetic acid. When dry this paste forms a cake which is then made into flakes, cords or grains, according to the purpose for which it is intended. This powder has about twice the strength of gunpowder. It is smokeless because the products of the explosion are all gaseous. The products of the explosion of gunpowder are nearly one-half solid matter, and it is this matter that makes the smoke.

Smokeless powder has replaced gunpowder in all artillery and in the navies of all leading nations. It is also used for blasting in certain cases. Each nation has its own variety of powder, to which it gives a special name. *Cordite* is used by the British; *indurite*, by the United States, and *B. N.*, by the French.

SMOLLETT, TOBIAS GEORGE (1721-1771), a novelist and miscellaneous writer, born near Dumbarton, Scotland. He studied medicine at the University of Glasgow and was apprenticed to a surgeon. His interest, however, was rather in literature than in surgery; and in 1739 he went to England with a tragedy, *The Regicide*, but failing to get for it a stage production, he joined the navy as surgeon's mate. On his return to England he again took up literature. The first of his novels, *Roderick Random*, appeared in 1748,

and its success was immediate. Among his later works the most noteworthy are *Peregrine Pickle* and *Humphrey Clinker*. His novels are carelessly constructed, often coarse and usually marked by a humor which descends frequently into burlesque.

SMOOT, REED (1862-), a United States Senator, born at Salt Lake City, Utah. He was educated at the Brigham Young Academy, Provo, Utah, in 1900 was made an apostle of the Mormon Church, and in 1903 was elected to the United States Senate. His prominence in the Mormon Church, an institution long favoring polygamy, caused strong opposition to his serving, and in 1906 he was unseated. In the following year, however, he was reinstated by Senatorial vote, and has since been reelected. Throughout his terms he has been an able representative of the Republicans and an expert on tariff questions.

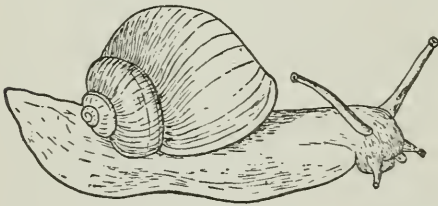
SMUGGLING, *smug'ling*, the fraudulent practice of taking dutiable merchandise into a country without paying the tariff imposed by law. To attempt to introduce goods through channels other than ports of entry; to attempt concealment of dutiable articles of high value; to understate the value of a taxable article—all are violations of law and are punishable with fine, imprisonment or forfeiture of goods. Introducing into a country articles prohibited by law is also regarded as smuggling and is punishable as such.

SMUTS, small fungi which live in certain plants as parasites. Wheat, oats and barley smuts attack the seeds, and can be destroyed by treating the seeds before planting. Wheat seeds soaked for five minutes in a solution of one pound of copper sulphate to a gallon of water are rendered immune; and oat seeds are treated by spreading them on the floor and sprinkling them with a solution consisting of one pound of formalin to fifty gallons of water. Another remedy consists in soaking the seeds in water above 135° F.

As corn smuts do not attack the seeds, they require a different treatment. The spores reside in manures and soils, and from the ground make their way into the young plants. The fungi appear at the tip of the ear as a bluish-black dust, which the wind scatters. They may also appear on the leaves or silk. Rotation of crops is the safest cure for corn smut, as the spores cannot live in the soil more than one season. Infected ears should never be used for planting.

SMYRNA, *smir'na*, the chief seaport of Asiatic Turkey, situated on the Gulf of Smyrna, 200 miles southwest of Constantinople. It occupies a site consisting partly of level ground and partly of the slopes of Mount Pagus, and when seen from the sea presents an attractive appearance. The city is divided into five quarters—the European, quarter, with a fine quay, modern shops and hotels; the Greek, the Armenian, the Turkish and the Jewish quarters. The Turkish section occupies most of the high ground. Smyrna has a fine wharf and carries on an important foreign trade, exporting raisins, sponges, carpets and rugs, opium, tobacco, licorice and numerous other articles. The rugs for which it is especially famed come from small places around the city. Most of its trade is with Great Britain. The city is connected with Constantinople by rail and with a number of other important towns in Asia Minor. Population, estimated at 250,000, about one-third of whom are Greeks and one-third Turks. During the World War Smyrna was bombarded by an allied fleet, but was not occupied until after the signing of the armistice.

SNAIL, a small mollusk, which inhabits a univalve, or one-piece, shell. Two general divisions are recognized—land snails and water snails. The shells of land snails are arranged in whorls, which may rise to a point



SNAIL

or may be comparatively flat. Some of them are very beautiful. To protect itself the snail can withdraw into its shell and seal the opening with a membrane. In moving about it carries its shell, to which it is attached by a muscular process, on its back. The part of the snail that protrudes from the shell is called the foot. The head is on the forward end of the foot and contains two sets of tentacles, or feelers, the larger of which are tipped by the eyes. The snail moves slowly, by contracting one portion of the foot after another, and it is aided in its movements by a slimy fluid which it secretes. Land snails live in

damp, shady places usually amongst moss and decaying wood. In France and Italy a species of small snail is cultivated as a food.

SNAKE, a reptile, distinguished by its long, slender body, which tapers gradually to a tail and which is covered with horny scales, but never with bony plates. Snakes have no limbs, though in some species rudimentary hind limbs may be detected. The ribs are very numerous, some snakes having more than 300 pairs. These give form to the body, aid in breathing, and are also, in connection with the scales, organs of locomotion. Snakes crawl upon the ground, by swinging their bodies in loops from side to side, and most of them are able to raise their heads and a large portion of their bodies into the air. They have hooked, conical teeth, which serve to hold their prey, but are useless for chewing.

Some species of snakes are fatally venomous, but most of them are harmless. In the venomous serpents two long poison fangs are firmly fixed in a movable bone, above which is a gland for the secretion of poison. The teeth are perforated by tubes through which the poison is forced. The tongue of a snake is forked, and can be pushed far out of the mouth. It is probably an organ of touch rather than of taste.

Snakes have no eyelids and no external ears. Their nostrils are on the snout. The lower jaw is loosely articulated to the upper, and the tissues about the mouth are so elastic that a snake can swallow an animal really much greater in diameter than itself. Some snakes lay eggs, others produce the young alive. In most species the mother takes great care of her young, and it is said that in one species, the mother, when alarmed, will open her mouth and allow the young to run to cover within her body.

Each locality of the temperate and torrid zones has its own peculiar species of snakes. Some live only in warm, arid regions; some live in moist, shady places, while still others inhabit the water. All the species are vastly more numerous and much larger in the tropics than in the temperate regions. Over 1,500 genera are known, and about twenty poisonous species are found in the United States. Of these the majority inhabit the southwestern portions of the country; two rattlesnakes and the copperhead are the only poisonous species that are natives of the Northern states.

Related Articles. Consult the following titles for additional information:

Adder	Copperhead
Anaconda	Moccasin Snake
Black Snake	Python
Boa	Rattlesnake
Cobra	Viper

SNAKE BIRD. See DARTER.

SNAKE CHARMING. See SERPENT CHARMING.

SNAKE DANCE. See HOPI.

SNAKE INDIANS. See SHOSHONEAN INDIANS.

SNAKE RIVER, a large river of the northwestern part of the United States. It rises in Yellowstone Park, pursues a winding course through Southern and Western Idaho, enters Washington at Lewiston, the head of navigation, and discharges into the Columbia River, near Pasco, Wash. It forms the boundary between Idaho and Northeastern Oregon for 170 miles, and between Idaho and South-eastern Washington for thirty miles. Its upper course is broken by numerous falls and rapids, the most spectacular of which are Shoshone Falls. The total length of the river is about 1,100 miles.

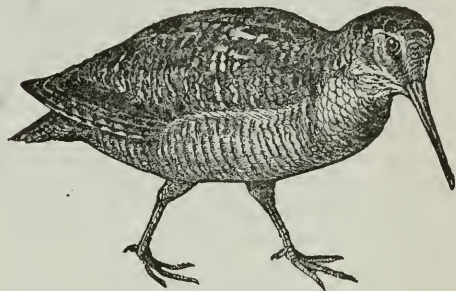
SNAPDRAGON, a group of annual and perennial herbs, most of them native to the temperate parts of the northern hemisphere. They bear spikes of showy, variously-colored flowers having two lipped corollas, so shaped that if opened forcibly they afterward shut with a snap. Thus the name is accounted for. The lower, three-lobed lip is so swollen as to resemble a mouth, and to suggest such descriptive names as dog's, rabbit's and toad's mouth. The plants grow to a height of from one to three feet. They are associated with old-fashioned gardens, but are much cultivated in conservatories. In folklore these plants are credited with power to undo charms.

SNAPPING TURTLE, a species of fresh-water tortoise, common to all parts of the United States. It sometimes reaches a length

of three feet and is notable for its fierceness. One species, found around the lower Missis-

sippi Valley, is called the *alligator-snapper* and is noted for the strength of its large jaws. It feeds on small animals and receives its name from its habit of snapping at every-thing within its reach.

SNIFE, a wading bird usually seen along the shores of rivers and lakes. Snipes are slender and active, both on land and on the

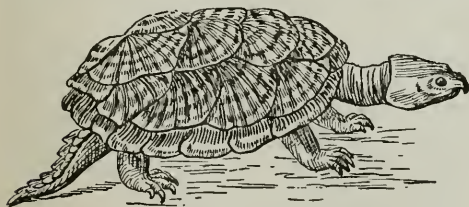


SNIFE

wing. All have narrow bills, longer than the heads, and their eyes are set far back. Usually the plumage is brownish or grayish, and is spotted or streaked with white or black, the whole blending closely with the colors of the ground. The nests are made on the ground among tall marsh grasses, and the eggs, four in number, are olive-brown or drab spotted with brown. When the bird is aroused near its nest, it flies up and down in a zigzag course, making with its wings a curious drumming sound. Common species are *Wilson's snipe*, a native American bird, and a similar species, the *European snipe*; others are the small *jacksnipe* of Northern Europe and the *giant snipe* of Brazil.

SNORING, *snor'ing*, a breathing with harsh, rough noise through the nose and mouth while sleeping, especially with rattling vibrations of the soft palate. While there are some persons who sleep with open mouth, owing to relaxation of facial muscles, there are others who because of some diseased condition of the nasal passage cannot breath through the nose. Children who snore do so almost invariably because of some throat or nasal trouble, which should be corrected. Adenoids which hinder nose breathing are a frequent cause of snoring in children. See ADENOIDS.

SNORRI STURLUSON, *snor're stoor'loo son*, (1179-1241), an Icelandic poet and historian. His most famous work, the *Prose Edda*, one of the earliest masterpieces of Scandinavian literature, was completed in



SNAPPING TURTLE

of three feet and is notable for its fierceness. One species, found around the lower Missis-

1222, but was not published until the seventeenth century. His *Heimskringla* and record of the kings of Norway from the earliest time to Magnus Erlingsson (1177) also was printed then. Snorri was also a lawyer and a statesman, and in 1215 was president of the legislative assembly and higher court of Iceland. He negotiated a peace treaty between Iceland and King Haakon of Norway, and that ruler, later becoming suspicious of him, had him put to death.

SNOW, frozen vapor falling to the earth in flakes, and covering Mother Earth with a white blanket to protect and prepare vegetation for its awakening in spring. Snow is also of incalculable value as it piles in masses on lofty mountains, where the gradual thaw of spring and summer feeds the springs and streams.

Whenever precipitation occurs at a temperature below 32° F., snow is formed. It is not frozen rain, but consists of minute crystals formed by the freezing vapor. These take various shapes, but are patterns of a six-pointed star, which in large flakes are very beautiful. By collecting such flakes on a coal-black surface, these crystals may be studied with an ordinary magnifying glass. Each flake contains a number of crystals, so arranged as to form beautiful designs, the size depending upon the temperature and the amount of moisture in the atmosphere. Flakes are largest when the atmosphere is heavily charged with moisture and the temperature is just below the freezing point. The amount of water in snow is about one-tenth that in rain; that is, a snowfall of ten inches would be equivalent in water to a rainfall of one inch.

Snow is found in cool temperate regions in the winter, and it falls on the summits of high mountains and in the polar regions throughout the year. The heaviest snowfall is in mountains of the cool temperate regions, where it is several feet each winter, as in the Alps and in some portions of the Rocky Mountains, particularly in the State of Washington and in British Columbia. When frozen in great masses, this snow forms glaciers. The line of perpetual snow is known as the *snow line*, and its location depends upon altitude and latitude.

Related Articles. Consult the following titles for additional information:

Avalanche	Ice
Crystallization	Rain
Freezing	Snow Line
Glacier	Snowshoe

SNOWBALL, or **GUELDER-ROSE**, *ge'lder*, a flowering shrub. It is a cultivated form of high-bush cranberry and grows from seven to twelve feet in height. Because of its large, white ball-like blossoms, it is known as the *snowball*. The name *Guelder-rose* is derived from the Dutch province of Guelderland, where the shrub is said to have originated. The flowers of the cultivated plant do not produce fruit; the wild guelder-rose, however, bears small, juicy, red berries.

SNOWBERRY, the popular name of a tropical American shrub which bears snow-white berries. The name is also applied to a native North American shrub of the woodbine family, which also has white berries.

SNOWBIRD, a name given to several finches that early in the spring go far north to nest, returning late in the fall. They gather in large flocks and feed in the snow on the seeds of grass and large plants. The *snowbunting*, often called the snowbird, is common in the northern United States. It has a gray back, white breast and black and white tail and wings, and is a very pretty bird.

SNOWDROP, a well-known garden plant, belonging to the amaryllis family. It bears a few short, straight, narrow, crisp leaves, and leafless flower stalks, on which are borne drooping, white, bell-shaped flowers, which appear early in spring. The plant is a native of the Alps, but is common in gardens in the Northern United States and Canada.

SNOW LINE, the height or level at which there is perpetual snow. In the tropics it is about three miles above the sea level, and mountains that rise to that height are always capped with snow; in latitude 40° it is about two miles above sea level; and at 55°, it is one mile above the sea. Above the Arctic Circle and below the Antarctic it descends to sea level.

SNOWPLOW, a machine for clearing the snow from roads, sidewalks and railways. Such devices are usually triangular, and are hauled by horses. They push the snow to either side of the path and are useful when the snow does not reach a great depth, after which the accumulation of snow on the sides of the path renders their use somewhat difficult.

Snowplows used on railways are of two kinds—the triangular plow, which is attached to the front end of the locomotive or a special car and removes the snow by being forced

through it, and the rotary plow. The triangular plow differs from that used on ordinary roads in that the sides form an oblique edge, which points downward to the middle of the track. As the plow is forced through the snow it lifts it up and then throws it out on either side of the track.

The rotary plow consists of a large wheel, with buckets attached to an axis, that rotates at right angles to the rails. As the wheel revolves, the buckets scoop up the snow and empty it into a hopper, from which it is thrown to a great distance by a powerful fan. The rotary plow is operated by a special engine and is pushed along by a locomotive. Its effectiveness does not depend upon the speed with which it is moved forward, and it is successful in clearing the deepest of drifts. The danger of delaying traffic for hours or days because of snow depths has practically been overcome by the effectiveness of the modern snowplow.

SNOWSHOE, *sno'shoo*, a device attached to the sole of the shoe to prevent the wearer from sinking into deep snows. It consists of a light frame of wood from three to four feet long and about a foot wide, reinforced with cross bars and strung with thongs of deerskin. Snowshoes are used by hunters, trappers, loggers and farmers in regions where snowfall is heavy. In these shoes the half-breed Indian trappers of Canada, who are the most expert users of them, can run over the snow at the rate of thirty-five or forty miles a day. In all sections of country where snows are heavy, many people use snowshoes as a pleasant diversion; in many localities snowshoe clubs exist as a feature of outdoor sports.

SNUFF, a powder made from the tobacco plant. The dry leaves and stems of the plant are ground in mortars and then scented. Snuff is inhaled through the nostrils, or is rubbed on the gums as an indulgence, like tobacco chewing. The practice of using it, once fashionable in Europe and America, is fast dying out. See TOBACCO.

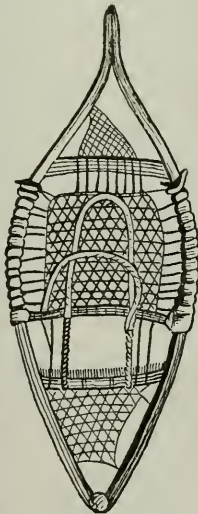


SOAP, *sope*, a chemical compound of fat or oil, with some alkali, usually potash or soda. There are many varieties, but the soaps of commerce may be roughly classified as household soaps, toilet soaps, manufacturing soaps and marine soaps.

Manufacture. The fat used in common laundry, or household, soaps is tallow, which may be mixed with grease or oil, and is generally known as *stock*. In the course of the manufacturing process rosin is added. This gives the soap a yellow color and also aids in hardening it. The fat is poured in a melted state into large sheet-iron kettles, heated by steam coils. During the heating process lye is added from time to time, until the right proportions of fat and alkali are obtained. When the mixture has the appearance of thick gum, strong brine is added until the soap floats on the surface. As the mixture cools, the brine settles to the bottom of the kettle and is drawn off and worked for glycerine and salt. Fresh, strong lye and rosin are added to the soap, and the mixture is reheated and treated as before. Three operations of this sort are necessary before a soap of the desired grade is produced.

After the third heating cold water is added and the mixture is allowed to cool slowly to 150° F. Then the soap is run into a horizontal cylinder known as the *crutcher*, where it is thoroughly mixed by revolving paddles. During the mixing several ingredients are added, the most important being carbonate of soda. When thoroughly mixed the soap is run into large pans and allowed to harden. It is then cut into cakes by being passed between steel wires, and the cakes are stamped and wrapped ready for the market.

The manufacture of toilet soaps is similar to that already described, except that the *crutcher* is omitted. For the best grades of toilet soaps, olive oil, palm oil and cocoanut oil are used, and the process of refining is carried further than in the manufacture of laundry soaps. Coloring matter and perfume are added to some of the best soaps, but they are omitted from other grades equally good. Cheap, highly perfumed soaps



SNOWSHOE

should be avoided, because the perfume is usually added to disguise the odor of offensive fats. A soap made of pure oil and good soda is the best for a healthy skin.

Castile soap is made from olive oil and soda. Marine soap is made from cocoanut oil, potash, soda lye and salt; it will dissolve in salt water. The so-called, *naphtha* soaps contain kerosene and a very strong alkali. Manufacturers' soaps are known as *neutral*, because they contain no excess of alkali or fats. This is necessary since these soaps are used in cleansing raw material for delicate fabrics, such as silks and fine woolsens.

SOAPSTONE, or **STE'ATITE**, a soft rock with a soapy feel, composed chiefly of tale and ranging in color from light to dark gray. It is easily sawed into any desired shape. Blocks of the stone are used as foot-warmers, because they hold the heat a long time. Powdered soapstone is sometimes used to prevent friction in machinery, and a soft, white variety is used as tailors' chalk.

SOCIAL DEMOCRATS, the name of a political party established in Germany in 1863 under the influence of Ferdinand Lassalle. It began with a small membership and a simple program based on universal and equal suffrage. In 1875 the followers of Lassalle joined with those of Karl Marx and Friedrich Engels to form the party which became the nucleus of the leading political organization in the Germany of to-day. At the outbreak of the World War the Social Democrats commanded 4,500,000 votes, and were represented in the Reichstag, where they held the balance of power by over a hundred members.

The war caused a division in the ranks, and the party split into two factions—majority Socialists and minority Socialists. The former, led by such men as Philipp Scheidemann and Friedrich Ebert, supported the government and voted war credits; the minority Socialists, who organized under the name of Independent Social Democrats, demanded immediate peace, and preached international Socialism and class conflict. When the German emperor abdicated, in November, 1918, the majority Socialists organized the provisional government, and in the ensuing elections, in February, 1919, they secured control of the National Assembly. Friedrich Ebert was elected President of Germany, and Scheidemann became head of the Cabinet.

The following are the most important planks in the platform of the Social Democratic party, as formerly organized:

1. Universal, equal and direct suffrage by ballot in all elections.
2. Establishing the initiative and veto as means of direct legislation by the people.
3. Removal of all restrictions to the free expression of opinion and the right of meeting or association.
4. Abolition of all laws which place woman at a disadvantage as compared with man.
5. Universal education at the expense of the state.
6. Election of judges by the people.
7. A graduated income and property tax to meet all public expenses which are to be met by taxation. See GERMANY; SOCIALISM.

SOCIALISM, the name of an economic system by which all wealth produced is demanded as the property of individual workers, with the means of production the property of the community or the state. In other words, socialism seeks a change of attitude towards property. At present the world's work is carried on under the domination of private property. Socialism would reverse this process, so that the world's work would ultimately be dominated by public property. Socialists attribute all value to labor, and in the beginning they so emphasized manual labor that intellectual services were given little or no consideration. However, with the rise of a better class of thinkers this view was changed, and socialists of moderate views now understand that intellectual service is as necessary as manual labor.

Socialists argue that, since production is becoming more and more a social process, the control of production should be in the hands of the community or the state. They demand collective management of each industry and that all industries be associated together in order to secure a perfect system, with harmony and unity of effort. They claim that each individual producer acts for himself, that the present industrial system is planless and that it causes industrial crises and business stagnation. Furthermore, if organized society owns the instruments of production and controls production, it would necessarily follow that the distribution of income would have to be by some common authority and that under this plan each worker would be assured of a living wage.

What Socialism is Not. The term *socialism* has been very loosely applied to a number of economic and political doctrines of a revolutionary character.

Socialism is not Communism. Communism advocates the abolishment of all private property, while socialism advocates the retention of private property in income or earnings, and the abolishment of private capital. The Bolshevik movement in Russia was an attempt to apply communistic principles on a large scale (see RUSSIA; BOLSHÉVIKI).

Socialism is not Anarchism. Both seek the same end, the largest freedom of the individual and general equality among men, but they seek this end by opposite means. Anarchism (which see) would abolish all government, while socialism would extend the powers of the state and make government paternal. Anarchism would gain its ends by violence wherever such means seemed to be advantageous, but sane socialism seeks to gain its ends by political evolution. Persuasion and the ballot are its two greatest agencies. "The socialist to-day is the strongest opponent of anarchism."

Political Socialism. Socialism is a world movement. Politically it is "socialism plus democracy." While there is a Socialist party in nearly every country, socialism has gained its greatest strength in Germany, where it first acquired political significance. There are strong Socialist parties in France, Holland, Italy and the Scandinavian countries. International socialistic congresses were held annually from 1889 to the outbreak of the World War, and in 1900 the International Bureau of Socialism was established at Brussels, Belgium. It consisted of forty-one delegates from twenty-seven nations. After the war another international conference was held in Switzerland.

In the United States. The evolution of socialism in America as a party movement has been rapid, as is shown by the Socialist vote at Presidential elections since the party entered the field. In 1888 it was 2,068; in 1904, 442,402; in 1912, about 1,000,000; but in 1916 it fell to 594,095. The national headquarters are in Chicago. Membership in the party is not confined to the cities; there is a large following in the agricultural states. See POLITICAL PARTIES IN THE UNITED STATES, subhead *Socialist Party*.

Socialism and the World War. The Socialist party is international in scope; its adherents are opposed to war, and it was thought at the outbreak of the World War that the Socialists, regardless of nationality, would unite in opposition to the war, and

put forth a strong plea for peace. On the contrary, the majority of the Socialists of all the belligerent countries adhered to their respective governments, and the chief effect of the war upon the party was to cause a division in its ranks and temporarily to break up the international organization. Adherents of the more radical wing maintained a strenuous opposition to the war, especially in Germany, where they boldly opposed the government, and declared that the war was not a war for defense. This caused a division in the party (see SOCIAL DEMOCRATS; GERMANY). In the United States the anti-war Socialists gained control of the organization when the country entered the World War, and many who supported the war left the party.

History. The beginning of the socialistic movement is considered to date from the organization in England of the *Association of All Classes of All Nations* in 1833. The term socialism was used in connection with the organization in a magazine called the *Poor Man's Guardian*, and it soon came into general use. The founders of modern socialism were Karl Marx and Friedrich Engels, who in 1845 organized in Brussels the *German Workingmen's Association*. Here they wrote the *Communists' Manifesto*, which summarized the philosophy of socialism and has since formed the basis of many socialist platforms. At first, socialism, like other new movements, was misunderstood and misjudged, but since the beginning of the twentieth century there is a clearer view. In 1916 it was estimated that the socialists had 11,000,000 voters throughout the world. Socialist parties existed then in twenty-seven nations, including Australia, Japan and most of the South American countries.

Related Articles. Consult the following titles for additional information:

GENERAL

Anarchism	Mothers' Pensions
Child Labor	Old Age Pensions
Communism	Recall
Convict Labor	Referendum
Income Tax	Sabotage
Inheritance Tax	Suffrage
Initiative	Syndicalism
Labor, Department of	Vocational Training
Minimum Wage	

EMINENT SOCIALISTS

Bebel, Ferdinand	Marx, Karl
August	Proudhon, Pierre
Lassalle, Ferdinand	Joseph

SOCIAL SETTLEMENTS, the name given to those houses, or centers, in the poorest districts of great cities, where cultured men and women live, in order to come in con-

tact with, and improve the condition of, the poorer classes. The activities of these societies include efforts at the development of the physical, mental, moral, spiritual and social interests of the poor. The oldest and most famous of the social settlements is Toynbee Hall in London, founded in 1884 and named in honor of Arnold Toynbee, who had taken the first steps toward its organization.

The earliest attempts at founding a settlement in the United States were made in 1887 by Dr. Stanton Coit, who established the Neighborhood Guild in New York. This developed into the University Settlement, which is one of the most efficient organizations of its kind in America. Two years after this settlement was established, Jane Addams and Ellen Gates Starr opened Hull House in Chicago, perhaps the most famous social settlement in the world. To-day there are social settlements in every large city in the United states, and their influence is potent in the development of civic affairs.

The scope of the work is almost unlimited. Nearly all maintain kindergartens, day nurseries, baths, libraries, schools of citizenship, clubs and savings banks, and give instruction at night in public-school subjects to day laborers whose education has been neglected. Social, political and religious meetings may be held in the settlement halls, and proper guidance, supervision and restraint are exercised by the resident workers. The social settlement is one of the most powerful influences at work to-day for the betterment of mankind. A detailed account of the workings of a large settlement is given in Miss Jane Addams' *Twenty Years at Hull House*. See ADDAMS, JANE.

SOCIETY ISLANDS, or **TAHITI**, *tah' hete*, **ARCHIPELAGO**, a French colonial possession in the Southern Pacific Ocean, consisting of two groups of islands, eleven in number, and embracing a total area of 637 square miles. The first group, the Leeward Islands, include Huahaine, Raiston, Tahao and Bora Bora. Of the Windward group Tahiti and Morea are the important islands. The islands are of volcanic origin, are mountainous and surrounded by coral reefs. They are densely wooded, and cocoanuts, bananas, sugar cane, oranges and other tropical fruits are cultivated. The climate is mild and moist, but healthful. The population is about 18,000, chiefly Malay.

SOCIETY FOR THE PREVENTION OF CRUELTY TO ANIMALS, the name given to various organizations whose chief purpose is to secure humane treatment for animals. The first society was organized in England in 1824. Interest in the movement spread, and in 1866 the first American society was organized, in New York. There are to-day such societies in all parts of the world. Through their influence important legislation has been enacted for the protection of domestic animals. Some of the laws are excellent. In many countries railroads are required to unload every twenty-four hours, to feed, rest and water, all stock which is being shipped great distances; and in nearly all countries cruelty to an animal is punishable with fine or imprisonment, or both.

SOCIETY OF JESUS, a Roman Catholic Order. See JESUITS.

SOCIOLOGY, *so she ol' o ji*, a science devoted to the study of society, including the fundamental facts upon which it is based, the history of modern societies, and the description and classification of present social phenomena. It thus covers in its broadest sense the study of the general progress of civilization, including history, economics, jurisprudence and politics. Sociology is based, of necessity, largely upon statistics, and its conclusions are arrived at through an historical and psychological study of the individuals who compose society and of the movements which in the past have affected its form and nature.

To Auguste Comte we are indebted for his conception of a comprehensive social science; he also gave to the study the name *sociology*. Its formal study is generally divided into four classes, each with corresponding divisions and subdivisions: *descriptive sociology*, *social psychology*, *social ethics*, and *social technology*.

Related Articles. Consult the following titles for additional information:

Capital Punishment	Juvenile Court
Census	Labor Organizations
Charity	Marriage
Child Labor	Monopoly
Communism	Mothers' Pensions
Convict Labor	Old Age Pensions
Coöperation	Pauperism
Crime and Criminology	Population
Economics	Prison
Environment	Prohibition
Eugenics	Social Settlements
Factory and Factory	Socialism
Legislation	Statistics
George Junior Re-	Suicide
public	Tenement
Heredity	Trusts
Illiteracy	Woman Suffrage
Immigration and	
Emigration	

SOCRATES, *sok'ra teez* (469-399 B. C.), one of the greatest philosophers of Greece. He was born at Athens, and, while his education was meager, so great was the inquisitiveness of his mind that he picked up the best thought current in the highly cultivated Athenian society of his day. From his father he learned the sculptor's art, but soon abandoned it and began to go about the streets of Athens questioning those he met on the eternal problems of human life.

For several years he fought as a common soldier. After that he devoted himself entirely to philosophy and the education of the youth of his native city, hoping thereby to make more useful citizens and a more firmly established and morally sound state. By means of conversation, which was simple, yet brilliant, he so illuminated commonplace facts that the great truths underlying them became apparent.

Because of his pure morality, honesty and interest in all mankind, Socrates was highly esteemed by the greatest thinkers of his day, and among his illustrious friends were Plato, Crito, Alcibiades, Xenophon, Aristippus, Euclid of Megara and Phaedon. Yet he was hated by those who opposed his just ideas of government and was accused of corrupting the youth of the state with heretical religious views. He was tried before a court of citizen jurors and in 399 B. C. was sentenced to death. His death potion was a cup of hemlock, drunk at twilight in the prison yard in the presence of his friends Plato and Crito. Of him Plato said, "Thus died the man who of all with whom we are acquainted was in death the noblest, in life the wisest and most just."

Socrates made no attempt to formulate a system of philosophy, nor to commit his ideas to writing. What we know of his doctrines is learned from Xenophon's *Memorabilia* and Plato's *Dialogues*. The great influence which he wielded is largely due to the fact that his ideas were made practical in his life. He was governed always by his high sense of virtue and obeyed conscientiously the promptings of an inner voice, which he declared to be a never-failing counselor. He attained to an intellectual strength and a spiritual peace that give him a place almost alone among the world's greatest thinkers.

SODA, in general, the name of several compounds of sodium found in nature; in particular, several manufactured products of

sodium chloride, or common salt. These include *sodium carbonate* (which may be produced in crystallized lumps or a coarse powder called *soda ash*), used in making glass and soap, for disinfecting and cleaning; and *sodium bicarbonate*, which is cooking soda. This latter is a constituent of baking powder and also of Seidlitz powders. Sodium hydroxide, commonly called *caustic soda*, is used in the manufacture of soap, dyestuffs and paper, and in bleaching and kerosene-oil refining.

SODA WATER, a popular summer beverage, especially in the United States. It is made of water charged with carbon dioxide and fruit flavoring. It contains no soda; it is called soda water because bicarbonate of soda was formerly used in making it. The liquid carbon dioxide is stored in a steel container under heavy pressure; when released by means of a faucet it permeates the water as carbonic acid gas, causing it to effervesce and imparting to it a pungent taste.

Pop, ginger ale and other similar drinks consist of water flavored with various extracts and charged with carbonic acid gas, which is kept under pressure in the bottle. When the cork is removed the gas escapes rapidly and causes the effervescence.

SODIUM, a metallic element discovered by Sir Humphry Davy in 1807. It is silver-white, has a very high luster and is as soft as wax. It is lighter than water, and if thrown on warm water its affinity for oxygen generates enough additional heat to cause ignition of the hydrogen. In contact with cold water the warmth generated is sufficient to melt the sodium. Owing to its affinity for oxygen it has to be kept in liquids that contain no oxygen, such as kerosene. When heated in air or oxygen it burns with a very pure and intense yellow flame. It is perhaps more abundant than any other metal, for it constitutes two-fifths of all the salt existing in sea water and is present in the water of springs, rivers and lakes, in almost all soils and in the deposits of rock salt. Sodium is also contained in sea plants and in land plants growing near the sea. It occurs, also, in most animal fluids.

Sodium is used as an agent in the manufacture of aluminum and magnesium, and as a reagent in chemical operations. Common salt is a compound of sodium and chlorine (see **SALT**). Sodium also occurs as oxide of sodium in a good many minerals;

but it is most common in the form of carbonate, nitrate and borate of soda. Of the numerous salts of sodium, many are important medicinal agents. *Sodium arsenate* is used as a substitute for arsenic and is an important element in fly poisons; *sodium bromide* and *sodium iodide* are prescribed for quieting the nerves; *sodium bicarbonate* is one of the important ingredients of baking powder. See SALTPETER; WATER GLASS.

SOD'OM, one of the five cities situated in the plain of the Jordan River, and referred to in the thirteenth and fourteenth chapters of *Genesis*. It was in Sodom that Lot settled when he separated from Abraham. The city was plundered by Chedorlaomer, and was afterwards rescued by Abraham. According to Biblical accounts, this and three other cities—one of them Gomorrah—in the vicinity were destroyed in a miraculous way because of their wickedness. It was at this destruction that Lot and his two daughters were spared, while his wife, not obeying the divine command, was turned into a pillar of salt (*Gen. XIX, 23-30*). The exact location of Sodom is unknown, and authorities differ in regard to it, some believing it to have been at the north end of the Dead Sea and others at the south end.

SODOM, APPLE OF, a fruit mentioned by early writers as growing on the shores of the Dead Sea. It was beautiful to the eye, but when eaten it filled the mouth with ashes. Although no satisfactory explanation has ever been given, it is supposed by some that this "apple" was a gall produced on dwarf oaks by an insect.

SOFIA, or **SOPHIA**, *saw'fe ya*, BULGARIA, its capital and largest city, situated in a plain on an elevation of 1,800 feet above sea level, near the Balkan Mountains, 325 miles north-northwest of Constantinople. It is on the line of railway that after Bulgaria's entrance into the World War was opened from Berlin to Constantinople. Sofia is built on modern plans and has broad, straight streets. The important buildings are the old mosque of Sofia, ruins of which still remain; the Mosque of Buyuk-Jami, used as a museum; the palace of the prince, and the government buildings. The city is the seat of a university founded in 1888. The chief industries include the manufacture of silk and other textiles, and of pottery. Sofia occupies the site of ancient Sardica, and in 1878, since which time the modern part of the city has

been rebuilt, it became the capital of Bulgaria. The city was bombarded by allied airships during the World War. Population, 1910, 481,598.

SOIL, that part of the earth upon which we depend for everything we eat and wear, and upon which all animals and plants depend for their sustenance. But this is not what the geologist or the agriculturist calls the soil. To the former the soil is the loose layer on the surface of the earth's crust; to the latter it is that portion of this layer in which plants grow and which is suitable for tillage.

Formation of Soil. The process of forming soil has been in operation since the first solid masses of the earth's surface appeared, and the same agencies which began its formation at that time are still at work and are producing the same results. These agencies are the atmosphere, water, plants and animals, and are explained below.

The atmosphere aids in the formation of soil by mechanical and chemical action—by mechanical action, when strong currents of wind wear away rock in certain localities and deposit the particles in others; by chemical action, when under conditions of moisture the oxygen of the air takes certain substances of which the rock is composed and destroys them, thus causing the rock to crumble.

Water is the most powerful agent in the formation of soil, since it does more than all other agencies in decomposing rocks. It decomposes rocks by wearing them away, as in the case of water in streams, and by breaking up rocks into particles as a result of freezing. At the foot of all cliffs masses of rock fragments are found. These are formed by the water's entering crevices in the rock and freezing and breaking the particles off. These particles are in turn broken up by weathering and by similar action of the water. Water also acts chemically, since oxygen readily attacks substances which the water dissolves from the rock. The combined action of water and atmosphere is known as weathering, and this is by far the most important process in the formation of soil.

Plants contribute to the formation of soil by the decay of roots, leaves and stubble, and frequently by the decay of the entire plant. The roots also assist in breaking up rocks by growing in crevices; and the absorption of nutriment by the plant also decomposes rocks to a limited extent.

Animals contribute to the formation and enrichment of soil by their excrement, by the decay of their carcasses and by burrowing. A good illustration of this is found in the earthworm, which bores its hole by passing the soil through its body. During this process the soil is pulverized and enriched. The holes thus made allow the air to enter the soil, and in this way a fresh supply for soil breathing is furnished (see EARTHWORM). Thousands of insects make the soil their home, and in numerous ways they contribute to its fineness and fertility.

Kinds of Soils. The composition of soil depends upon that of the rock from which it was formed. When the soil overlies the decomposing rock, it is usually of the same nature, but along river beds and in localities which are the beds of ancient lakes, the soil may be of entirely different composition from that of the surrounding rock, since it was transported a long distance by water. A *sandy* soil is one whose composition is nearly three-fourths sand. A *clayey* soil is about half clay, while a *lime* soil is about one-fifth lime. A *peaty* or vegetable soil is made up of peat or vegetable matter. *Loams* are soils containing a mixture of clay, sand, lime and decayed vegetable matter, known as *humus*.

Soil Water. All soil contains water, the amount depending upon the condition of the country in regard to rainfall, and the nature of the soil itself. In soils most suitable for tillage the water exists in the form of a thin film around each minute particle of soil, similar to the film formed around a marble when it is dipped in water. Soils containing clay retain the water much longer than those composed principally of sand or gravel. When too much water is present it gathers in excavations made in the soil and is known as free water. The presence of free water is injurious to growing crops, since it drowns the roots and prevents their obtaining the necessary amount of nourishment.

Value. The soil is the great storehouse of wealth, not only for the farmer, but for all others as well. A fertile soil is the first requisite to successful agriculture. Soil is considered fertile when it contains an abundance of plant food in such state that the plants can appropriate it as needed. The chief ingredients of this food are nitrogen, potash and phosphorus, which occurs in the form of phosphates. The nitrogen is ob-

tained from the decomposition of organic matter which constitutes that portion of the soil known as humus. Potash and phosphorus exist in the mineral portions of the soil, which must be chemically decomposed before these substances can be used by the plant. Many soils, rich in potash and phosphorus, or both, are unavailable because these substances are not in a state to make them available for plant food. On such soils the sort of fertilizer needed is some ingredient that will decompose the rock particles which hold the potash and phosphorus in insoluble form.

Soil Analysis. Before the farmer can obtain the best results from his labors, he must understand thoroughly the condition of his soil; that is, he should know the plant foods it contains and the relative proportion of each. Also, he should know whether or not each of these foods is in such a state that it is available for the plants. So important is this knowledge that the agricultural colleges are making soil surveys throughout their respective states, and the United States Department of Agriculture is doing a similar work for the tillable portions of the public lands.

Any farmer wishing to know the chemical constituents of his soil should write to the agricultural college of his state. If the soil in the vicinity of his farm has been surveyed, he will obtain the desired information. If it has not been surveyed, he will be told what steps to take to secure the analysis. In general, the funds of these colleges do not enable them to analyze soil for individual farmers. The college will, however, refer the farmer to some chemist who will make the analysis for him. The fee is usually ten dollars, but if the knowledge gained enables the farmer to produce more bountiful crops, or to render fertile what the farmer supposed to be worthless soil, the money is very wisely invested. Analysis of the soil of many so-called worn-out farms shows that right methods of treatment will in a few years make them as productive as ever. The best authorities state that the first 16 inches of soil contain an average of 7,122 pounds of nitrogen, 6,035 pounds of phosphoric acid and 23,160 pounds of potash to the acre. Fertilizing the soil means setting these ingredients free as frequently as it means supplying them.

How to Study Soil. First determine whether or not the soil has been formed

chiefly from the underlying rock. If it has, it is of the same composition as the rock, with the addition of humus. If the soil is alluvium, that is, soil has been deposited by water which overflowed the land, its composition will be very different from that of the soil upon higher levels in the same locality. Moreover, alluvium contains a large proportion of humus.

To determine the texture of soil, dry a quantity, then break it into fine particles. If it is lumpy and pulverizes with difficulty, it contains a good proportion of clay. If more than one-half of it is clay, it is known as clayey soil. If about three-fourths of it is sand, it is a sandy soil. If one-fifth of it is lime, it is a limy soil. A soil containing a mixture of sand and clay is loamy.

A perfect soil contains these various ingredients in suitable proportion. It must have sufficient sand to enable it to absorb the requisite quantity of air and moisture, and to render it warm and friable. It must have sufficient clay to prevent too rapid leaching or evaporation of water, sufficient lime to aid in the decay of vegetable matter and enough humus to enable it to retain the best amount of moisture and to furnish the necessary material for the chemical changes necessary to healthy plant growth.

Next determine whether or not the soil is "sour." Soils that have not been worked for a long time are liable to contain an excess of acid. Crops do not thrive in such soils, and before planting, it is always wise to test them for acidity. For this test, procure a small quantity of litmus paper from a drug store. Take a quantity of the soil and moisten it. Lay a strip of litmus paper upon it. If the soil is sour the paper will soon turn red. Soils containing excess of acid can be restored to their normal condition by treating them with slaked lime or hot ashes.

To determine the relative proportion of humus, thoroughly dry a quantity of soil and weigh it. Then place it on an old shovel blade or some other flat metallic surface and heat it to redness. The humus will be burned out. After cooling, weigh again.

What was the loss in weight?

What proportion does this loss sustain to the first weight?

Local conditions may suggest further investigation, and if the farmer is in doubt as to the best method of procedure he should write to his agricultural college, from which

he may always feel sure that he will receive reliable information.

Related Articles. Consult the following titles for additional information:

Alluvium	Humus
Agriculture	Loam
Clay	Loess
Drainage	Manures
Dry Farming	Marl
Erosion	Phosphates
Fertilizer	Rotation of Crops
Irrigation	Sand

SOISSONS, *swa son'*, FRANCE, the capital of an arrondissement in the department of the Aisne, sixty-five miles northeast of Paris. It is one of the oldest towns in France and was the scene, in 486, of the victory by Clovis over the Roman general, Syagrius, which put an end to Roman dominion in Gaul. The cathedral of Notre Dame and the town hall, with a library and museum, are the principal buildings. Soissons was in the battle zone of the World War, and suffered severely from bombardments during the Battle of the Aisne and the Battle of Soissons. In May, 1918, it was captured by the Germans in their great spring offensive.

SOKOTO, *so ko'toh*, one of the largest states of the British colony and protectorate of Nigeria, in Northern Africa. It has an area of 100,000 square miles and a population of 10,000,000. The land along its northern border, which meets the Sahara Desert, is arid and unproductive. In the south, where there are fertile farming and pasture lands, agriculture and cattle raising are the principal industries, and barley, millet, wheat and hides the chief products. Ostrich farming and coffee raising are growing industries. The most important towns are Sokoto and Kano.

SOLA'NUM, a genus of the nightshade family, containing a wide variety of both useful and nonuseful plants. Among the former are the potato, the tomato and the eggplant. The horse nettle and buffalo bur, spiny weeds that give considerable trouble to farmers, belong to the nonuseful group. The bitter-sweet, another species, is the source of a fluid of medicinal value, and the common nightshade, or belladonna, is also medicinal. The genus contains several hundred species, including herbs and shrubs, and is the most important branch of the nightshade family. See NIGHTSHADE.

SOLAR ENGINE, or **SUN MOTOR**, an apparatus for utilizing the heat of the sun as a motive power, by causing it to convert the water in a small boiler into steam. The most

successful motor yet constructed was invented in 1901 and placed upon a farm near Pasadena, Calif. It consisted of a large mirror, in the form of an umbrella, with a part of the top cut off. The disk contained 1,788 small mirrors arranged at an angle so to catch all the sun's rays striking upon it and to reflect them upon a long boiler containing 100 gallons of water and space for eight cubic feet of steam, set in the center, like the handle of the umbrella. The boiler was connected with machinery that pumped water at the rate of 1,400 gallons each minute. By an automatic arrangement, as soon as sufficient steam was generated in the boiler, the mirror was connected with a system of clock-work which caused it to turn with the course of the sun.

With the reduction in the expense of their manufacture, solar motors of this pattern will make very desirable machines for pumping water for irrigation, as the heat developed by them is very great.

SOLAR MICROSCOPE, an instrument by means of which a magnified image of a small object is projected on a screen, by sunlight or strong artificial light. It is much like a stereopticon. The object to be magnified is placed on a stand at one end of a brass tube. By means of a mirror, rays of light are reflected into the opposite end of the tube; a double-convex lens brings the light rays to focus on the object, while another lens projects a magnified image of the object on the screen. Sunlight is less frequently used with these microscopes than the electric arc or oxyhydrogen limelight.

SOLAR SPECTRUM. See LIGHT, sub-head *Spectrum*; SPECTRUM ANALYSIS.

SOLAR SYSTEM, in astronomy, the name given to the group of celestial bodies, including the sun and its attendants, which revolve about it in elliptical orbits. To this system belong the eight great planets and their satellites, the asteroids lying beyond Mars, comets and meteorites.

The size of the great solar system is utterly beyond comprehension. Herschel's illustration was that if the earth were represented by a pea, the sun would be a ball two feet in diameter, 327 feet away on one side, and Neptune a plum a mile and a quarter away on the other. (See elsewhere in this work articles on each of the planets and on each group of bodies that belong to the solar system.)

Related Articles: Consult the following titles for additional information:

Astronomy	Gravitation	Planetoid
Asteroids	Meteor	Satellite
Comet	Planet (with list)	Sun

SOLDERS, *sod'urz*, alloys used in joining the surfaces or edges of metals by fusion at the point of contact. The solder should always fuse more easily than the metal intended to be soldered by it. Solders are of two kinds, hard and soft.

The *hard solders* are ductile, will bear hammering and are commonly prepared of the same metal as that which is to be soldered, with the addition of some other, by which a greater degree of fusibility is obtained. Under this head comes the hard solder for gold, which is prepared from gold and silver, or from gold and copper, or from gold, silver and copper. The hard solder for silver is prepared from equal parts of silver and brass, but it is made to fuse more easily by the mixture of one-sixteenth of zinc. The hard solder for brass is obtained from brass mixed with a sixth or an eighth, or even a half, of zinc, and this may also be used for the hard solder of copper.

Soft solders melt easily, but as they are partly brittle, they cannot be hammered. Of this kind are the following mixtures: Tin and lead in equal parts; bismuth, tin and lead in equal parts; bismuth, two parts, tin and lead, each one part.

In soldering, the surfaces to be united must be made perfectly clean and free from oxide.

SOLDIERS' HOMES, homes for disabled or aged soldiers of the United States armies, divided into two general classes: those administered and maintained by the Federal government and those administered and partly maintained by state governments in certain states.

Home for Regular Army Soldiers. The United States maintains a home for disabled and discharged soldiers of the regular army at Washington, D. C., known as the United States Soldiers' Home. All soldiers who have served twenty years in the army and those who have incurred such disability as to disqualify them for further service are admitted. The home is in charge of commissioners.

Home for Volunteer Soldiers. Another federal institution is the National Home for Disabled Volunteer Soldiers, which is subdivided into ten branches in various cities of the United States. These are located in the following cities:

Dayton, Ohio	Leavenworth, Kan.
Milwaukee, Wis.	Santa Monica, Cal.
Togus, Me.	Marion, Ind.
Danville, Ill.	Jackson City, Tenn.
Hampton, Va.	Hot Springs, S. D.

Confederate veterans of the Civil War have a home at Beauvoir, near Biloxi, Miss., the former estate of Jefferson Davis.

State Soldiers' Homes. There are a number of state homes for disabled soldiers who for various reasons are unable to secure admission to the national institution. The Federal government contributes toward the support of the state homes \$100 for each soldier, based upon the average attendance for the year. The remainder of the expense is paid by the individual state. Some of these homes are conducted on the cottage plan. The following is a list of the state homes:

California—Yountville.	Nebraska—Gd. Island.
Colorado—Monte Vista.	New Hampshire—Tilton.
Connecticut—Noroton Heights.	New Jersey—Kearny and Vineland.
Idaho—Boise.	New York—Bath and Oxford.
Illinois—Quincy.	North Dakota—Lisbon.
Indiana—Lafayette.	Ohio—Sandusky.
Iowa—Marshalltown.	Oregon—Roseburg.
Kansas—Fort Dodge.	Pennsylvania—Erie.
Massachusetts—Chelsea.	Rhode Island—Bristol.
Michigan—Grand Rapids.	So. Dakota—Hot Springs.
Minnesota—Minnehaha.	Vermont—Bennington.
Missouri—Saint James.	Washington—Orting and Port Orchard.
Montana—Columbus Falls.	Wisconsin—Waupaca.
	Wyoming—Cheyenne.

SOLE, a broad, flat fish with a dorsal fin extending from head to tail. The common European sole, a brown fish with very white, firm flesh, is much esteemed for the table. The average length is about twelve inches, and the weight is eighteen ounces. These fishes live most of the time in shallow waters of sandy coasts; sometimes they ascend rivers in the spawning season, and they retire to the depths of the ocean in cold weather. They are sometimes caught with lines, but usually with trawl-nets. The American sole, or *hogchoker*, common on the Atlantic coast, is a smaller fish, only about six inches long, and is not much used for food. The transparent sole of the Pacific coast differs from most other species in having no fins on the under side.

SOLEMN LEAGUE AND COVENANT.

See COVENANT.

SOLICITOR, *solis'itor*, a person authorized by law to represent another in court of

justice. In the United States the distinction between solicitors and other lawyers is not recognized. Under the laws of Great Britain solicitors constitute a class of attorneys who are officers of the court, the go-betweens of the barristers; the latter act as advocates in the argument and conduct of cases. A solicitor may appear before a magistrate in the lower courts, but cannot appear as an advocate in a superior court.

SOLID. In geometry this term signifies a magnitude which has the three dimensions of length, breadth and thickness. In physics a solid is a body having a definite shape and thus differing from liquid and gaseous bodies, which conform to the shape of the space containing them.

Related Articles. Consult the following titles for additional information:

Arithmetic	Cylinder	Prism
Cone	Geometry	Pyramid
Cube	Mensuration	Sphere
Cubic Measure		

SOLITAIRE, *sol e tair'*, any card game played by one person. The player shuffles the pack, from which certain cards may have been eliminated, then plays the cards, one at a time, holding the pack face downward. The object is to arrange the cards in suits, building up or down according to certain rules. Most games of solitaire depend for their working out solely on the run of the cards not on any skill of the player.

SOL'OMON (the Prince of Peace), the third king of Israel, was the son of David and Bathsheba. He was born in Jerusalem and was chosen by David to succeed to the throne, instead of his elder brothers. He was about twenty years old when he came to the throne and ruled nearly sixty years, until 931 B. C.

By his remarkable judicial decisions and his completion of the political institutions of David, Solomon gained the respect and admiration of his people; while by the building of the Temple, which gave to the Hebrew worship a magnificence it had not possessed, he bound the nation still more strongly to his throne. The wealth of Solomon, accumulated by a prudent use of the treasures inherited from his father, by successful commerce, by a careful administration of the royal revenues and by an increase of taxes, enabled him to meet the expense of building palaces, cities and fortifications, and of supporting a luxurious court. Fortune long seemed to favor this great king; and Israel, in the fullness of its prosperity, scarcely perceived that he was

continually becoming more despotic. Contrary to the laws of Moses, he admitted foreign women into his harem; and in his old age permitted the free practice of their idolatrous worship and even took part in it himself. Toward the close of his reign troubles arose in consequence of these delinquencies, and the growing discontent, coming to a head after his death, resulted in a division of the kingdom.

The wisdom of Solomon is proverbial. He knew human nature and possessed a store of facts not known by any other man of his time. According to the Bible, he spoke "three thousand proverbs and his songs were a thousand and five." Of these only the poem known as *The Song of Solomon* and the proverbs contained in the Biblical book of *Proverbs* are known to-day, and the authorship of these is a matter of controversy. See SOLOMON'S SONG.

SOLOMON ISLANDS, a group of islands in the Western Pacific Ocean, lying southeast of Bismarek Archipelago, east of New Guinea and between New Britain and New Hebrides. The larger islands are of volcanic origin, and most of the smaller ones are of coral. Their total area is about 16,950 square miles. The climate is hot and unhealthful, earthquakes are frequent, and there are several active volcanoes. The population is estimated to be 180,000, nearly all of whom are Malays and Papuan negroes. Most of the islands are controlled by Great Britain.

SOLOMON'S SONG (called also the *Song of Songs*, or *Canticles*), one of the canonical books of the Old Testament. From the earliest period this book has been the subject of much controversy. It seems to have been a recognized part of the Jewish canon in the time of Jesus. Till the beginning of the present century the author of the book was almost universally believed to be Solomon, but modern critics attribute it to an author of Northern Israel, who wrote it about the middle of the tenth century B. C., shortly after the death of Solomon, in a spirit of protest against the corrupt splendor of the court of Zion. By the Jews it has been regarded as a spiritual allegory, embodying the union of God and Israel; by Christian theologians it has been regarded as symbolizing the relationship of Christ and the Church.

SOLOON (638?-558? B. C.), one of the seven wise men of Greece, and the first great legislator of Athens. At the risk of his life

he urged the Athenians to recover Salamis. He was made chief archon in 594 B. C., and was invested with unlimited powers. He established a new constitution, divided the citizens according to their wealth and added to the powers of the popular assembly. He made many laws relating to trade and commerce, and he either entirely abrogated all debts or so reduced them that they were not burdensome to the debtors, abolishing the law which gave a creditor power to reduce his debtor to slavery. When he had completed his laws he bound the Athenians by oath not to make any changes in his code for ten years. He then left the country, to avoid being obliged to make any alteration in them, and visited Egypt, Cyprus and other places. Returning after an absence of ten years, he found the state torn by the old party hate; but all parties agreed to submit their demands to his decision. It soon became evident, however, that Pisistratus would succeed in gaining the chief power, and Solon left Athens. Though Athens now fell under the despotic rule of Pisistratus, much of Solon's legislation remained effective. See GREECE, subhead *History*; ATHENS, subhead *History*.

SOLSTICE, *sol'stis*, in astronomy, the point in the ecliptic at the greatest distance from the equator, at which the sun appears to stop or cease to recede from the equator, either north in summer or south in winter. There are two solstices—the summer solstice, the first degree of Cancer, which the sun reaches about the 21st of June, and the winter solstice, the first degree of Capricorn, where the sun is about the 22d of December. The time at which the sun is at either of these points also receives the same name.

SOLUTION, the transformation of matter from either the solid or the gaseous state to the liquid state, by means of a liquid called the *solvent*, or *menstruum*. When a liquid adheres to a solid with sufficient force to overcome its cohesion, the solid is said to undergo solution, or to become dissolved. Thus, sugar or salt may be brought into solution by water; camphor or resin, by spirit of wine; silver or lead, by mercury. Solution is facilitated by increasing the extent of the surface exposed to the solvent, which may be most easily done by reducing it to powder. Heat, by diminishing cohesion, usually favors solution; but there are exceptions to this rule, as water just above the freezing point will dissolve nearly twice as much lime as it dissolves at

the boiling point. If a solid body be introduced in successive small portions into a definite quantity of a liquid capable of dissolving it, the first portions disappear most rapidly, and each succeeding portion dissolves less rapidly than its predecessor, until solution altogether ceases. In such cases the forces of adhesion and cohesion balance each other, and the liquid is said to be *saturated*.

SOLWAY FIRTH, *furth*, an arm of the Irish Sea, between Scotland and Cumberland County, England. Throughout its length of thirty-five miles it is shallow, ebb tide leaving much of its coastal bed dry. The spring tide enters the firth in a bore six feet high and at the rate of ten miles an hour. Salmon and other fish are abundant, and fishing is an important industry. The principal ports on its shores are Whitehaven, Harrington and Kirkcudbright. The rivers flowing into it are the Esk, the Derwent, the Dee, the Nith and the Annan.

SOLYMAN II, or **SULEIMAN II**, *soo'lay mahn*, surnamed *the Magnificent* (about 1495-1566), sultan of the Turkish Empire, the son of Selim I, whom he succeeded in 1520. Having put down a revolt which occurred in Syria and Egypt and having concluded an armistice with Persia, he besieged and took Belgrade in 1521. The next year he captured the island of Rhodes, which had been in the possession of the Knights of Saint John for over two hundred years. Turning his arms against Hungary, he won the Battle of Mohacs and captured Buda and Pesth. In 1529 he advanced on Vienna, but was forced to raise the siege, with great loss. His armies next gained considerable territories from Persia. In 1541 he overran a great part of Hungary, but an armistice was concluded in 1547. Late in his reign he attempted the capture of Malta and began another war against Hungary, but died in the midst of his plans. He was an enlightened ruler, considering the age in which he lived, and under him Turkey reached the height of its power.

SOMALILAND, *so mah' le land*, or **SOMALI**, a region in the eastern part of Africa, forming the peninsula which lies between the Gulf of Aden and the Indian Ocean. Politically it is divided into four dependencies, subject to France, Great Britain, Italy and Abyssinia, respectively. The boundaries of Abyssinian Somaliland are indefinite, running into desert conditions.

French Somaliland, or **Somali Coast**, as it is officially known, is the most northerly of the Somaliland dependencies, lying at the head of the Gulf of Aden. Its area is 5,790 square miles, and its population is about 213,000. The coasts are hilly; the interior is an elevated plateau. It carries on an export trade in gold, ivory, skins, hides and coffee. Jibuti, the principal port, which is also the seat of government, has a population of 16,500.

British Somaliland, officially known as *Somaliland Protectorate*, borders on the Gulf of Aden and adjoins Somali Coast and the Italian and Abyssinian dependencies. Almost its entire area of 68,000 square miles is a sandy plain, broken by occasional mountains of basalt and granite. The population, about 36,000, is made up chiefly of wandering herdsmen. Ivory, cattle, sheep and skins are exported. The largest town and seat of government is Berbera, which has a population of about 30,000.

Italian Somaliland, called officially *The Colony and Protectorate of Italian Somaliland*, extends from British Somaliland to the Juba River. Almost its entire area of 139,430 square miles is arid. The coast is flat; the inland is hilly. The chief exports are skins and hides; small quantities of cotton, gums and live stock are also exported. The population is about 365,000. The chief ports are Obbia and Mogadiscio. The country is administered by a governor.

SOMERVILLE, *sum'ur vil*, MASS., a city in Middlesex County, adjoining Boston, Chelsea and Cambridge, on the Mystic River and on the Boston & Albany and the Boston & Maine railroads. The city is built on seven hills and covers an area of about four and one-fourth square miles. It is primarily a residence place and contains many fine homes. There are fine public parks and a number of places of considerable historical interest. In Powder House Park is an old building, constructed about 1703 and used for a long time as a powder house. Central Hill was occupied by a redoubt during the siege of Boston, and on Prospect Hill Washington is supposed to have first unfurled the American flag. The city has a large public library, an industrial school for boys and business schools. The Somerville Hospital is partly supported by the city, and there are homes for the aged, a day nursery and an almshouse. Other prominent buildings are a city hall, a

Carnegie Library and a state armory.

There are various manufacturing establishments, of which the packing houses and the boiler tube works are the most important. Other products are desks, picture frames and jewelry. The place was settled about 1630, was incorporated as a town in 1842 and chartered as a city in 1872. Population, 1910, 77,236; in 1917, 88,618 (Federal estimate).

SOMME, *sohm*, a small river in Northern France, near which was fought in 1916 one of the severest battles in history. The river rises in the department of Aisne and flows southwest, entering the English Channel about fifteen miles beyond Abbeville. Its length is 140 miles. It is connected by canal with the Oise and the Scheldt.

Battle of the Somme, the Anglo-French offensive drive against the Germans in the summer of 1916, directed by Sir Douglas Haig, commander in chief of the British, and Marshal Joffre, commanding the French; American divisions assisted. In two weeks the British advanced three miles on a ten-mile front and captured 10,000 men; the French advanced six miles on an eleven-mile front and captured 12,235 prisoners. After a lull in August, the offensive was resumed early in September and was continued into November. The allies lost 675,000 men, the Germans 700,000. The allies, besides gaining 120 square miles of territory, inflicted heavy losses on the Germans, drew large forces from the eastern front and compelled the enemy to concentrate attention at the Somme instead of the vicinity of Verdun. See **WORLD WAR**.

SOMNAMBULISM, *som nam' bu liz'm*, or **SLEEPWALKING**, a peculiar activity of the mental functions during sleep, wherein the subject moves and acts as if awake, although without consciousness.

Walking in sleep is the most noticeable, but not the most marvelous, characteristic of somnambulism. The somnambulist may perform many voluntary actions, which show that to all appearances he is conscious of the things surrounding him. He may get out of bed, dress himself, go out of doors, and walk, frequently over very dangerous places, in perfect safety; in fact, he may expose himself without fear to perils which in his waking moments would seem insurmountable. On waking in the morning, the subject is either utterly unconscious of having stirred in the night or remembers it only as a mere dream.

The sleepwalker should never be awakened nor startled suddenly.

In some cases somnambulists have held intelligent conversations. Sensitive and excitable people are subject to the complaint, which often accompanies other nervous affections. It appears to be hereditary. Tests have proved that a somnambulist cannot hear ordinary sounds; that he cannot see, whether his eyes be closed or wide open; and that he can neither taste nor smell. He is, however, endowed with surprising muscular control. Lady Macbeth's exhibition of somnambulism is famous in literature. The condition incited by hypnotism is an artificial somnambulism. See **HYPNOTISM**.

SOMNUS, (from the Latin, meaning *sleep*), in ancient mythology was the god of sleep, son of Nox (night) and twin brother of Mors (death). He was supposed to bring sleep both to gods and men.

SONATA, *so nah'tah*, an instrumental composition of three or four distinct parts or movements, each a complete composition in itself, and all held together by certain bonds of union and forming a perfect whole. The several movements may be likened to the chapters of a book, each of which has a distinct unity of its own and all related and combining to produce a single work. The sonata commonly begins with an allegro, a quick, vivacious composition; or it may begin with a slow introduction. This is followed by a slower movement—*andante*, *adagio* or *largo*. Then comes a minuet, trio or scherzo, and finally a rondo in quick time. The concerto, the symphony and the suite are all written in the sonata form. Haydn and Mozart excelled in this form, and Beethoven was the greatest master of it.

SONNET, a poem of fourteen lines, rhyming according to a prescribed scheme. The form is of Italian origin. The sonnet is usually written in ten-syllable or five-foot measure; but it may be written in eight-syllable lines. It consists of two groups of lines or verses. The first is a group of eight lines (two quatrains); the second is a group of six lines (two tercets or triplets). The rhyming scheme of the first group is: *a, b, b, a; a, b, b, a*; that is, the first, fourth, fifth, and eighth lines rhyme and the second, third, sixth and seventh. The tercets may have two rhymes or three thus: *c, d, c, d, c, d*, or *c, d, e, c, d, e*. There are many deviations from the sonnet as described. The Shakespearean sonnet con-

sists of three quatrains of alternating rhymes and a couplet at the end. In modern French sonnets the tercet opens with a couplet and ends in a quatrain of alternating rhymes.

The sonnet usually consists of one principal idea elaborated. The lightness and richness of the Italian, Spanish and Portuguese languages enable their poets to express every feeling or fancy in the sonnet; but in English it has been found most suitable to grave, dignified and contemplative subjects. Among the most successful writers of English sonnets are Shakespeare, Milton, Wordsworth, Mrs. Browning and Rossetti. Mrs. Browning's *Sonnets from the Portuguese* are the most celebrated group of poems of this kind in our literature, and as examples of the most famous single sonnets from other authors may be mentioned Milton's *On His Own Blindness*; Wordsworth's *On Milton*; Shakespeare's "Let me not to the marriage of true minds;" Keats's *On Looking into Chapman's Homer*; Shelby's *Ozymandias*. Milton's *On His Own Blindness* is here given complete:

When I consider how my life is spent
Ere half my days, in this dark world and wide,
And that one talent which is death to hide
Lodged with me useless, though my soul more bent
To serve therewith my Maker, and present
My true account, lest he returning, chide;
"Doth God exact day-labor, light denied?"
I fondly ask. But Patience, to prevent
That murmur, soon replies, "God doth not need
Either man's work, or his own gifts. Who
best
Bear his mild yoke, they serve him best. His
state
Is kingly; thousands at his bidding speed,
And post o'er land and ocean without rest;
They also serve who only stand and wait."

SONS OF LIBERTY, in American colonial history a society, organized for the purpose of opposing certain British policies unfavorable to the colonies. It came into existence in 1764, at the time of the Stamp Act agitation. In the beginning it was not a single organization, but a group of public-spirited associations with members in all the thirteen colonies, those in New York and Connecticut being the most active. The work was in time coördinated, and the society was chiefly responsible for the repeal of the Stamp Act in 1766. The members favored independence, and had much to do with the calling of the Continental Congress.

SONS OF VETERANS, an American patriotic society organized at Philadelphia, Pa.,

on September 29, 1879. Only lineal male descendants of honorably discharged soldiers, sailors and marines who served in the Civil War are admitted to membership, which at present is about 56,000. The insignia of the society is a bronze bar (on which is inscribed *Filii Veteranorum*, the Latinized name of the society), with a medallion bearing a monogram of the letters "S V" in a wreath above crossed cannons. The Daughters of Veterans is a similar organization.

SOOT, a black substance which results from the imperfect combustion of certain substances. Wood, coal and some fuel oils are the principal soot producers. Smoke and its accompaniment soot are among the chief nuisances of large cities. It has been estimated that in London the damage from soot is \$25,000,000 a year; in Pittsburgh, Pa., it was once nearly as great. Soot has a certain economic value. The large amount of nitrogen it contains makes it valuable as fertilizer. The pigment called *bistre* is made from chimney soot, and *lampblack* is the product of oil or resin soot. See SMOKE.

SOPHIA, *so'fe ah*, CHURCH OF SAINT. See SAINT SOPHIA.

SOPHISTS, *sof'ists*, a class of Greek philosophers who appeared in the fifth century B. C. They did not originate positive doctrines, but exerted a negative influence, maintaining a critical attitude toward existing ideas and attempting to overthrow established institutions and systems of thought. By false reasoning they were able to make what was the worst appear the better. Therefore they argued, since through reason, the highest of human faculties, man is led astray, human knowledge is worthless. Protagoras, the leading Sophist, held that since knowledge of the external world is dependent on sensation, and since sense impressions are variable, knowledge cannot be accurate. Therefore, there is no ultimate criterion, and each man is the measure of his world, and all knowledge and belief are relative. The Sophists failed to detect the identity beneath differences of appearance or to apprehend the unity of life. The logical outcome of such teaching and belief was the doctrine that each man was a law unto himself. The Sophists were despised by Socrates and by his followers.

SOPHOCLES, *sof'okleez* (about 496-406 B. C.), one of the greatest of Greek dramatists, was born at Colonus, a suburb of Athens. His first play *Triptolemus*, submitted in com-

petition with Aeschylus, won a first prize; and for thirty-two years he produced plays, receiving first prize twenty-four times. He served the state on several occasions. In 440 B. C. he was chosen one of ten generals in the war against the aristocrats of Samos; later he was a general in the Peloponnesian War.

Of the 130 plays ascribed to Sophocles, seven are extant and of undisputed authorship. They are, in chronological order, *Antigone*, *Electra*, *Trachiniae*, *Oedipus Tyrannus*, *Ajax*, *Philoctetes* and *Oedipus at Colonus*. Sophocles brought the Greek drama to the highest point of which that form of art is susceptible. He introduced several dramatic innovations—a third actor, an increase in the size of the chorus, and scenery. Whereas the characters of Aeschylus are heroic, those of Sophocles are human, revealing in the author a masterly knowledge of human nature. The tendency of the plays is ethical, and means are subordinated to ends. No tragic poet of ancient or modern times has written with more elevation and purity of style than Sophocles, and his versification stands alone in dignity and elegance.

SOPRANO. See SINGING.

SORBONNE, *sor boh'n'*, a famous university in Paris, a great center of French learning, and the outgrowth of a medieval theological seminary founded by Robert de Sorbon. In its early history it was one of the most important theological schools in Europe. Its faculty was constantly called upon to pronounce opinions on important questions, and it exercised a decided influence on French history. After the French Revolution the theological school disappeared, and the institution was devoted solely to the advancement of all other higher learning. In the middle of the nineteenth century the Sorbonne became the property of the city of Paris, and in 1889 a splendid building called The New Sorbonne—perhaps the finest university building in the world—was erected. The faculties of science and letters of the University of Paris are installed here. In normal times the registration of students is about 5,000.

SOREL, *so rel'*, QUE., the county town of Richelieu County, on the right bank of the Richelieu River at its junction with the Saint Lawrence, and on the Canadian Pacific and the Quebec Southern railways. It is forty-two miles northeast of Montreal, with which it has daily boat connection in summer. The

shipbuilding establishments and foundries are important. There are also manufactories of agricultural implements, sash and doors, clothing, plumbers' supplies, aerated waters and saws. Population, 1911, 8,420.

SORGHUM, *sawr' gum*, a genus of grasses, one species of which is cultivated for its sweet sap, from which a molasses, popularly known as sorghum, is made. About 15,000,000 gallons of sorghum syrup are produced annually in the United States. Sorghums are tall plants, without ears but with seed heads at the top. Closely related species are kafir corn and broom corn, which are not syrup producers. They are used as forage plants and as packing for silos.

SORORITY, an association of women and girl students corresponding to the men's fraternities in colleges and universities in the United States. Sororities followed logically the introduction of coeducation in colleges and came to be a regular part of woman's participation in the social activities of college life. Like the men's fraternities, they are secret to the extent of protecting their mottoes, constitutions and grips from the knowledge of outsiders. Each sorority has branches, called "chapters," in the various colleges, only one, however, in each institution. Most of them publish catalogues, containing interesting information about the sorority, and some issue periodicals. The oldest of the coeducational sororities is the Kappa Alpha Theta, founded at De Pauw University in 1870.

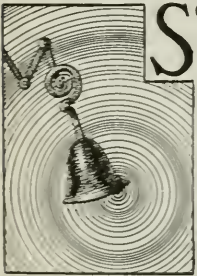
SORREL, a perennial herb of the buckwheat family. The plant grows to be two feet high and has sour, juicy, arrowshaped leaves. In Europe it is cultivated and used as a potherb and for salads. The common American sorrel is a smaller plant, and has small white, yellow or pink flowers. *Sheep* sorrel has wide-spreading roots, which make it troublesome to farmers. Indian sorrel, grown in the tropics, is used to flavor jellies and to make cooling drinks. Of the other varieties, the most common are *mountain*, *switch* and *water* sorrel.

SORREL TREE, a tree belonging to the heath family, found in the southeastern part of the United States as far north as Pennsylvania. The leaves are long and toothed and strongly acid, and from them a cooling drink may be prepared. Clusters of small, white, ball-shaped flowers are produced in summer, and after these, tiny egg-shaped berries covered with down. The sorrel tree some-

times grows to be sixty feet high. The wood is hard and fine-grained, and is used for making such articles as tool handles.

SOTHERN, *suth'urn*, EDWARD H. (1859-), an American actor, born at New Orleans, La., the son of a famous actor. At the age of twenty he began his theatrical career in New York and after five years' struggle became leading man in Sardou's *Scrap of Paper*, in Howard's *One of Our Girls* and in *The Highest Bidder*. In 1888 he was engaged by Daniel Frohman, and for a number of years was a leading man in the Frohman Stock Company, winning conspicuous successes in *Chumley*, *The Prisoner of Zenda* and *If I Were King*. In 1900 he began to devote his attention to Shakespearean rôles, and, in association with Julia Marlowe, produced Shakespearean repertory for several years. He married Miss Marlowe in 1911. His autobiography, *The Melancholy Tale of Me*, was published in 1916. Mr. Sothorn endeared himself to thousands of soldiers in France as a Y. M. C. A. entertainer during the World War.

SOUL, *sole*, the spiritual personality, the immaterial part of man as opposed to his body. Soul is sometimes conceived of as synonymous with *mind*, but generally it is used in a wider sense, as being a whole to which belong the faculties that make the mind. *Soul* and *spirit* are more nearly synonymous, but each is used in connections in which it would be improper to use the other. Nearly all philosophies agree in regarding the soul as that part of man which enables him to think and reason, and which renders him a subject of moral government, but they differ when it comes to a question of origin and detail. Those matters have been forever providentially hidden from man.



SOUND. Sound is produced by air vibrations from a solid body. Touch lightly the edge of a small bell or the tongue of a jewsharp when it is sounding, and you will feel the vibrations, but your touch will probably stop the vibrations and sound will cease. The

reeds of an organ, the strings of a violin, the wires of a piano, the head of a drum and all other sound-producing bodies vibrate in producing sound.

How Sound Travels. The vibrations of the sounding body start similar vibrations in the body through which the sound travels. When a bell is rung, the vibrations of the bell start vibrations in the atmosphere, which move in every direction from the bell and carry the sound. Sound will travel through any elastic substance, but it will not travel through a vacuum.

Sound travels through air at a temperature of 32° F., at the rate of 1,090 feet per second, and this velocity increases 1.1 feet for every additional degree in temperature; at 60° the velocity is 1,120 feet. Sound travels through hydrogen about four times as fast as through the air, and it moves through water at about 4,700 feet per second; through copper, its velocity is a little over eleven times as great as through the air, and through steel it is about fifteen times as great. By noticing a flash of lightning and counting the number of seconds between it and the report of the thunder, the distance of the cloud can be determined. The sound requires five seconds to traverse a mile, so the distance in miles is one-fifth the number of seconds.

Loudness of Sound. The loudness of sound depends upon the size of the vibrations; the greater the vibration, the louder the sound. Large bodies in vibration produce louder sounds than small ones. The intensity decreases in proportion as the square of the distance from the sounding body increases. When the distance from a sounding body is doubled, the sound is reduced to one-fourth. Speaking tubes confine the sound within narrow limits, so that the sound waves are conveyed much farther than they would be in the open air.

Difference in Sound. One man sings bass, another tenor; one lady has a soprano voice, another sings contralto. Some people speak in low, heavy tones, and others in high tones. The different keys on the piano give forth different tones. What is the cause of these different sounds? If we examine the piano we find that the keys that strike the long heavy cords are those that produce the low, heavy tones, and that the keys that produce the high tones are those that strike the short, fine cords. We can apply this illustration to any other sound-producing body and find that it holds true. The difference in sounds is due chiefly to the difference in the number of vibrations of the sounding body in a given time. The low tones are produced

by those bodies that have a low number of vibrations per second, and the high tones by those that produce a high number of vibrations. This is illustrated in the musical scale; middle C tone is produced by 256 vibrations per second. The other tones are as follows:

C	D	E	F	G	A	B	C
256	288	320	341	384	427	480	512
Do	Re	Mi	Fa	Sol	La	Ti	Do

The difference in pitch produced by doubling the number of vibrations is called an *octave*.

Reflection of Sound. When sound waves strike a hard surface, they are thrown back, or reflected, in the same way as are rays of light from a mirror. Curved walls, like the domes of buildings and the rounded ceilings and ends of audience rooms, reflect sound waves to a common point, and a person standing at this point can often hear a whisper that is uttered in some other part of the room. For this reason the name *whispering galleries* has sometimes been applied to such places. Ear trumpets are simply instruments for gathering waves of sound and reflecting them to a common point, and they are equivalent to an increase in the size of the ear. By their means sounds can be heard that could not otherwise be perceived.

An echo is produced when the reflecting surface is so far away that the sound which it throws back is distinct from the original sound. Remarkable echoes occur among mountains, where the ranges upon both sides of the valley are in such position that the sound is reflected back and forth several times. Audience rooms that are too large or are not well proportioned are often difficult to speak in, because of the echoes.

Quality of Sound. The difference between noise and music is, theoretically, the difference between regular and irregular vibrations. The quality of a tone depends upon the character of the sounding body. To illustrate, a piano, a flute and a violin may all produce a tone of the same pitch, but the tone of each can be distinctly recognized because of the differences between the instruments producing it.

Related Articles. Consult the following titles for additional information:

Ear	Light
Echo	Lightning
Harmonics	Music

SOUND'ING, the operation of finding the depth of water and the quality of the bot-

tom, especially by means of a plummet sunk from a ship. In navigation two plummets are used, one called the *hand lead*, weighing about eight or nine pounds, and the other, the *deep-sea lead*, weighing from twenty-five to thirty pounds. The former is used in shallow waters, and the latter at long distances from shore. Sometimes the nature of the bottom has been ascertained by attaching tal- low to the base of the deep-sea lead. The scientific investigation of the ocean and its bottom has rendered more efficient sounding apparatus necessary, and has led to the invention of more complicated contrivances.

SOUSA, *soo'za*, JOHN PHILIP (1854-), an American composer and band leader, born at Washington, D. C. He conducted the Marine Band at Washington at two different times and in 1892 he formed the organization known the world over as Sousa's Band. Sousa has written extensively for band and orchestra; and his military marches, among them *The Washington Post*, *Under the Double Eagle*, *El Capitan*, *King Cotton*, *Liberty Bell* and *The Stars and Stripes Forever*, are very popular. A number of descriptive suites and light operas also stand to his credit, and several novels. In 1917 Sousa was chosen to organize bands at the Great Lakes Naval Training Station and was made a lieutenant in the United States navy.

SOUTH AFRICA, UNION OF. See UNION OF SOUTH AFRICA.

SOUTH AFRICAN WAR (1899-1902), a war for supremacy in South Africa, fought between Great Britain and two Boer republics—the South African (now the Transvaal) and the Orange Free State.

Causes of the War. In 1884 gold was discovered in the Witwatersrand, which drew an increasing number of foreigners to the Transvaal each year. By 1899 the *Uitlanders*, as the Boers called the foreigners, outnumbered the original settlers by seven to three. Most of these foreigners were British subjects, and the Boers suspected them of hating the Dutch. Under the leadership of their president, Paul Kruger, the Boers planned from the beginning of this migration to keep the Uitlanders from gaining control of the government. The naturalization laws, which before 1885 had been liberal, were restricted, until in 1887 the term of residence for naturalization was fixed at fifteen years.

The foreigners, of course, claimed that they were entitled to a voice in the govern-

ment and that the restrictions imposed upon them were unjust. Jameson's Raid, in 1896, brought matters to a crisis, and although the British government had Jameson punished, the Boers used the incident as an excuse for further restrictions on the Uitlanders. The latter petitioned Great Britain, but the negotiations which the British government attempted to make with the Boers failed in the end, and it became apparent that the question could not be settled peacefully. War was declared in October, 1899, the Orange Free State joining cause with the South African Republic.

Campaigns of the War. When hostilities began, the British had about twelve thousand men in Natal, and small forces at Kimberley and other points. At the outset the Boers seemed to have a decided advantage. British forces were shut up in Ladysmith, Mafeking and Kimberley, but the other troops were unable by their successes in the field to offset these reverses. A large addition was at once voted to the English army in South Africa, and Sir Redvers Buller, on his arrival in Africa with reinforcements, at once moved to the relief of Ladysmith.

In December further reinforcements arrived under Lord Roberts, Lord Kitchener acting as his chief-of-staff. The British cavalry force also was increased, and thus one of the early drawbacks of the British was remedied. By the last of February, 1900, the sieges of Kimberley and Ladysmith had been raised, the relief of the latter place giving rise to much of the hardest fighting of the war. From this time on the tide of fortune was on the side of the British. In March, Bloemfontein was taken, and while there Roberts proclaimed the Orange Free State British territory, under the name of the Orange River Colony.

The British force then moved toward Pretoria, taking, en route, Kroonstadt and Johannesburg; in June Pretoria was occupied. President Kruger fled at the occupation of Pretoria. The three months which followed the capture of Pretoria were devoted by the British to an attempt to capture all the Boer forces in the neighborhood, and by the first of August it seemed as if all organized warfare, had ceased. Roberts, therefore, issued a proclamation in September, 1900, declaring the South African Republic British territory under the name of the Transvaal Colony.

In spite of their reverses in fortune, the Boers refused to make peace and a constant guerrilla warfare was carried on under De Wet and Botha. Kitchener, who had been left in command on Roberts' return to England, gained for himself much unpopularity by gathering into large camps, called concentration camps, the Boer women and children, and compelling them to live under conditions which caused much sickness and death. By May, 1902, the Boers had been forced to the point of exhaustion, and they accepted the peace on which England insisted.

The Terms of Peace. Peace terms provided that all Boers lay down their arms and acknowledge themselves subjects of Edward VII. In return, all prisoners outside of the colonies were to be sent back to their homes, and no action was to be taken against burgers for acts in connection with the war. Provision was also made for the teaching of the Dutch language in the public schools in all cases where it was desired by the parents, and its use permitted in court. It was also provided that the military administration of the two colonies was to be superseded by a civil government at the earliest possible moment.

Related Articles. Consult the following titles for additional information:

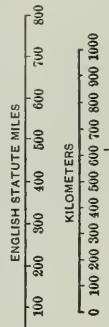
Boer	Ladysmith
Orange Free State	Rhodes, Cecil John
Starr	Transvaal
Kimberley	Union of South Africa
Kitchener, Horatio	
Herbert, Earl	
Kruger, Stephanus	
J. P.	



SOUTH AMERICA, the fourth largest grand division of the earth. It is the southern continent of America, or the New World, and is separated from North America in part by the Caribbean Sea and the Gulf of Mexico and is connected with it by the narrow Isthmus of Panama. Although the two continents have developed economically along decidedly individual lines, it is interesting to note that together they represent the world's great centers of democracy; no independent country in this vast expanse has a monarchical form of government.

Size and Location. South America is but little more than two-thirds as large as North

SOUTH AMERICA



GALAPAGOS IS.
(TO EQUADOR)
Same scale as large map.



RELIEF MAP OF SOUTH AMERICA

America; it has much more nearly the regular shape of a triangle than has its northern neighbor. Its greatest length from north to south is about 4,800 miles, and from east to west it is about 3,300 miles. The area is 7,700,000 square miles, and it therefore occupies about one-seventh of the total land area of the globe.

Coast Line and Islands. Few gulfs or bays break the continent's remarkably regular coast line. The large indentations are on the north, the Gulf of Darien; on the northeast, the mouth of the Amazon, and on the southeast, All Saints Bay, the Bay of Rio de Janeiro, the mouth of the Rio de la Plata, Bahia Blanca, Gulf of San Mantias and Gulf of Saint George. There are few islands belonging to the continent. Those worthy of mention are Trinidad, off the northern coast, the Falkland Islands, east of the southern extremity of the continent, and the Galapagos, on the equator, west of Ecuador.

Mountains and Plains. There are three systems of mountains in South Africa, the greatest of which is the Andean Cordillera, or the Andes, on the Pacific coast, stretching in a continuous chain for over 4,000 miles, from Cape Horn to the Isthmus of Panama. Next to the Himalayas, in Asia, this is the highest mountain range in the world. Its loftiest peak is Aconcagua, reaching a height of 23,080 feet. Many of the Andean peaks are active volcanoes, and severe earthquakes are likely to occur throughout the chain. The second system is that of the highlands of Guiana, which lie north of the Amazon valley. Here are several irregular groups of mountains, about 2,000 feet high, which separate the plains of the Orinoco from those of the Rio Negro and the Amazon. The Brazilian highland, the third system, is very broad and is crossed by low ranges of mountains. Its average height is less than half that of the Andes.

From the configuration of its surface, the continent may be divided into five physical regions: (1) The low country skirting the shores of the Pacific Ocean, from fifty to 150 miles in breadth, and 4,000 miles in length; the two extremities of this territory are fertile, the middle is a sandy desert. (2) The basin of the Orinoco, a country consisting of extensive plains, or steppes, called *llanos*. This region is treeless, except for palms and mimosas which grow along the

streams and crown the low hills. In the rainy season this division is covered with grasses which afford fine pasturage, while in the dry season the heat is so intense that the region is hardly more than a desert. (3) The basin of the Amazon, a vast plain, embracing a surface of more than 2,000,000 square miles, possessing a rich soil and humid climate is covered almost everywhere with dense forests, which harbor innumerable tribes of wild animals and are thinly inhabited by savages, who live by hunting and fishing. (4) The great southern plain, watered by the Plata and the numerous streams descending from the eastern summits of the Andes; open steppes, which are here called *pampas*, occupy the greater portion of this region, which is dry, and in some parts barren, but in general is covered with a strong growth of weeds and tall grass, which feed large herds of horses and cattle and afford shelter to a few wild animals. (5) The country of Brazil, eastward of the Paraná and the Uruguay, presenting alternate ridges and valleys, thickly covered with wood on the side next the Atlantic, and opening into steppes, or pastures, in the interior.

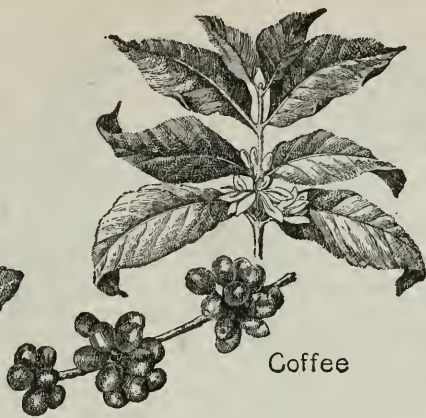
Rivers. The three important river systems of South America are the Amazon, the Orinoco and the Plata. All of these rivers flow into the Atlantic. The Amazon, the largest river system in the world, drains nearly one-third of the continent. It rises in the Andes, is 4,000 miles long, and is navigable for about 2,300 miles. It has many large, navigable tributaries. The Orinoco rises in the Parima Mountains, and is 1,400 miles long. It is navigable throughout most of its course in the lowlands. The Orinoco and the Amazon systems are connected by a small river called the Cassiquiare. The Plata is formed by the confluence of the Paraná and the Uruguay rivers and is 185 miles long; at its mouth it is about 125 miles wide. It is navigable for more than 1,000 miles. The principal smaller rivers are the São Francisco, the Rio Negro, the Magdalena and the Colorado.

Lakes. South America contains comparatively few large lakes. The largest, Titicaca, in the Andes, covers an area of about 500 square miles and is over 12,000 feet above the level of the sea. There are several small lakes in the mountain regions, but none is of special importance.

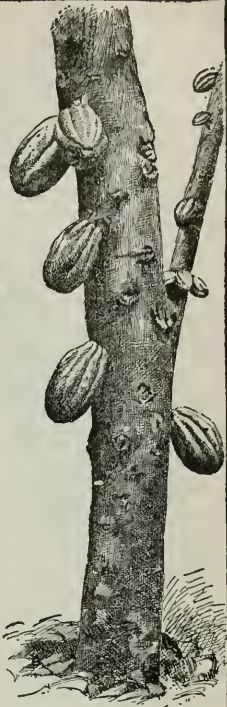
Mineral Resources. The mineral wealth of South America includes gold, silver and cop-



Paraguay Tea



Coffee



Cacao



Ipecac



Cinchona



Cassava



Vegetable Ivory



India Rubber

per, mined chiefly in the Andes; nitrate of soda, used as a fertilizer and in the making of gunpowder; mercury, diamonds and coal, as well as other valuable minerals. Chile is rich in copper and silver, and the coal mines give promise of great wealth. There are celebrated silver mines in Bolivia and considerable supplies of gold in Venezuela and Guiana. Some rich gold mines have been discovered in the southern part of Argentina. Brazil has extensive deposits of coal and iron. Previous to the discovery of the diamond field in South Africa, it was the chief source from which diamonds were obtained. Emeralds are also found in Venezuela.

Climate. Considering its extent in latitude, South America has a remarkably equable climate. The extremes of heat and cold which characterize North America are not found here. The northern portion of the continent, although lying within the tropical regions, has the intense heat greatly modified by its elevations, and some of the highest peaks in the Andes, even under the equator, contain snow throughout the year. The lowlands along the Orinoco, the Amazon and the coast of Brazil have a hot climate. The southern portion of the continent is free from sudden changes or extremes, because of the nearness of the oceans and the influence of the mountains along the western coast.

The rainfall is heaviest in the Amazon basin and diminishes toward the south, until the arid region, constituting a large part of Argentina and Patagonia, is reached. The southern portion has a damp climate, characteristic of the cool temperate regions. The seasons are just the opposite of what they are in the northern hemisphere, the summer occurring in December, January and February, and the winter in June, July and August.

Vegetation. The vegetable kingdom in South America has a magnificent development, particularly in the vast tropical territory east of the Andes, the basins of the Amazon, the Orinoco and their tributaries, where the genera and species are very abundant, the forests large and the forms gigantic. Besides palms, there are dye-woods of all sorts, cedar, mahogany and ebony; farther south are the araucarias of Chile and the beech forests of Argentina. There are numerous kinds of fruit trees, the fruits of which are usually very large and covered with

extremely thick shells. Among these may be mentioned the cannon-ball tree and the Brazil nut tree. Ferns and water lilies are also numerous and splendidly represented. The jungle, or undergrowth, in the forests is impenetrable in many places. Cinchona is found on the higher ground within the tropics. A holly is grown, the leaves of which are soaked in water and produce a beverage called *Paraguay tea*. During the rainy seasons the pampas and llanos are covered with a thick growth of grass and other vegetation.

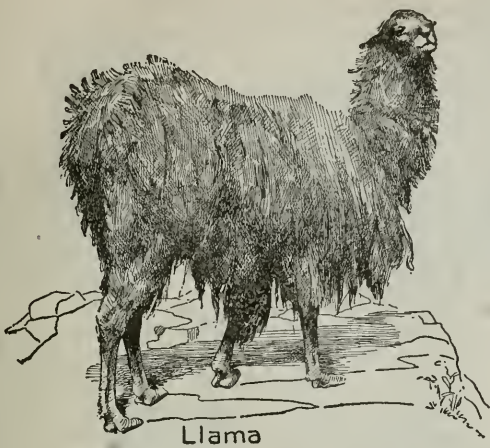
Industries and Products. The leading industries of South America are herding, agriculture and mining. The pampas in the South and the llanos in the north furnish a wealth of pasture lands, while the valleys of the Plata River system, the southeastern part of the Brazilian plateau and the river valleys along the northern coast of the grand division constitute the great agricultural regions.

The selvas of the Amazon valley yield much of the world's supply of India rubber, as well as great quantities of Peruvian bark. Coffee, sugar cane, cotton, cacao, cassava and tobacco are the products of the torrid zone; while the temperate regions yield abundant crops of wheat, corn, barley and flaxseed.

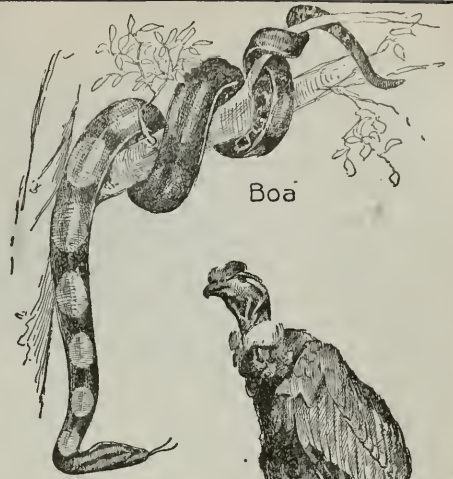
The foreign trade of South America is mainly with the United States and Europe. During the World War, when so many European countries were closed to commerce, the trade between South America and the United States was greatly stimulated. A better understanding between these two countries was developed, and with it came the opening of new markets which promise great commercial opportunities and advantages for the future.

South America's most valuable commercial commodities are coffee, rubber, wool, hides and nitrate of soda. The continent's most extensive railway system is in the southern section. A tunnel through the Andes affords railroad connection between the Plata and the Pacific, while the only commercial route in the central region is supplied by the Amazon and its tributaries. Many short railways interlink the Andes with the west and east coasts.

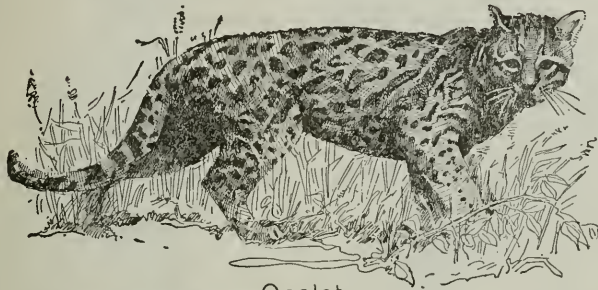
Animal Life. The zoölogy of South America is extensive and peculiar, embracing a fourth of all the known mammals, among which, however, are almost none of the wild animals so abundant in Africa and Asia.



Llama



Boa



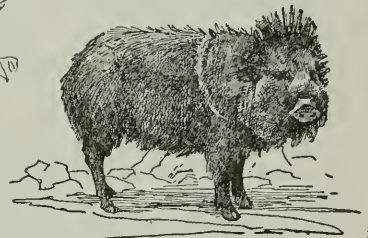
Ocelot



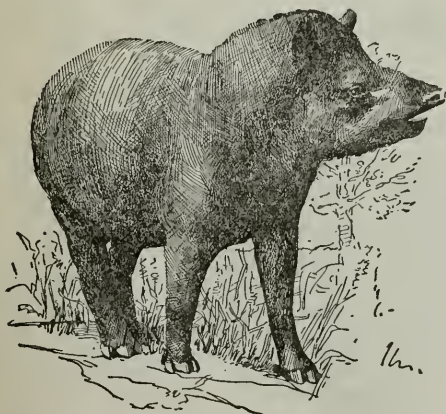
Condor



Great Ant-Eater



Peccary



Tapir



Rhea

The most powerful of the carnivora is the jaguar, which is the only formidable beast of prey in the whole continent. In the selvas are found most of the animals living in trees, and with the exception of the tapir, jaguar, ant-eating bear and boa constrictor, they are small. Among these are monkeys, sloths, peccaries, many richly-colored but songless birds, and countless insects and reptiles. In the rivers are found alligators and the whalelike manatee. The armadillo is said to be the only wild animal that increases with the increase of population. Many of the species are peculiar to South America and are not found elsewhere. The llama, alpaca, vicuna and little chinchilla are found in the Andes; the llama is also used as a beast of burden. In the mountains the deer, bear, panther and the great condor are found.

Inhabitants. South America is more sparsely populated than North America. The densest population is found near the coast; the interior is thinly peopled, and chiefly by Indians. The aborigines of South America are undoubtedly of the same race as those of North America, as there exists a very striking general physical resemblance between the native races throughout the whole of the American continent, from Cape Horn to Bering's Strait. In South America these red men are far more numerous than in North America, and though many are half-civilized, a greater number are in a state of barbarism. A considerable portion of the population also consists of people of Spanish and Portuguese blood, and in addition there are a far greater number of mixed Indian and European blood, civilized and forming an important element in the various states of the continent. To these are now being added considerable numbers of Spanish and Italian immigrants.

Political Divisions. The political divisions, in their order from north to south, are Panama, Colombia, Venezuela, British Guiana, Dutch Guiana, French Guiana, Brazil, Ecuador, Peru, Paraguay, Uruguay, Argentina, or Argentine Republic, Bolivia and Chile.

History. Columbus first touched the continent at the mouth of the Orinoco in 1498. The next navigator to explore this continent was Hojeda, a Spaniard, who followed the coast from near the equator to Venezuela. He was accompanied by Americus Vespuccius, who published the first account of the New World (see AMERICUS VESPUCCIUS). Spain

and Portugal had almost entire control of the continent until the beginning of the nineteenth century. The Spanish colonies declared their independence in 1810, and after a ten years' war a number of republics were established. In 1823 Brazil became independent of Portugal and retained a monarchical form of government which lasted until 1889, when the form of government was changed to a republic. The only foreign possessions on the continent are those of British, French and Dutch Guiana.

South America was affected by the World War in much the same way as North America, as many of the republics on the southern continent suffered severely from the German submarine campaign. Brazil declared war on Germany on October 26, 1917, and Argentina, enraged by the insolence of a German diplomatic official, Count Luxburg, was all but swept into the conflict. Germany's disavowal of the attitude of the count prevented an actual rupture, but the allies had the sympathy of the majority of the Argentine people. Bolivia, Peru, Uruguay and Ecuador, manifesting their friendship for the United States, severed diplomatic relations with Germany before the close of 1917. While these nations could not take any decisive military part in the struggle, their attitude had a beneficial moral effect, and helped to stem the tide of German propaganda.

Related Articles. Consult the following titles for additional information:

POLITICAL DIVISIONS	
Each Country is Treated in a Separate Article.	
ISLANDS	
Falkland	Tierra del Fuego
MOUNTAINS	
Aconcagua	Cordillera
Andes	Cotopaxi
Chimborazo	
RIVERS	
Amazon	Paraguay
Madeira	Paraná
Magdalena	Río de la Plata
Orinoco	Uruguay
MISCELLANEOUS	
Inca	Patagonia
Indians, American	Titicaca, Lake
Llanos	

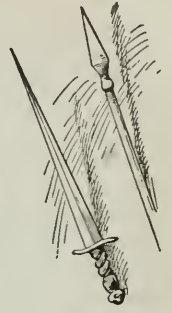
SOUTHAMPTON, *suth hamp'ton*, ENGLAND, a seaport town, situated on a peninsula at the mouth of the Itchen River, on Southampton Water, an inlet of the English Channel. It is eighteen miles northwest of Portland and seventy-nine miles southwest of London, and is a favorite summer resort. Southampton was formerly a walled town, and some of the wall and several gates still remain. Among the important buildings are



Pottery



A Native Home



Dagger and Spear



An Indian Woman



An Indian Man



Typical Open-Air Market Place

God's House, a hospital, and the churches of Saint Michael and Holywood. The town is the most important English seaport on the channel, and is a port of call and a coaling station. It is the seat of a university college established in 1850. From Southampton, in 1620, the *Mayflower* set sail for the New World, and in commemoration of this event a memorial tower was erected in 1914. Population, 1911, 119,012.

SOUTH AUSTRALIA, a state of the Commonwealth of Australia, occupying the south-central portion of the continent and extending from the Great Australian Bight, on the south, to the Northern Territory and Queensland, on the north. It is bounded on the east by Victoria, New South Wales and Queensland, and on the west by Western Australia. The Northern Territory was originally a part of South Australia, but was transferred to the Commonwealth in 1911. The area is 380,070 square miles, a little greater than that of the province of Ontario.

South Australia occupies a portion of the great Australian plain, and with the exception of some low mountains distributed over the state, the country is lowland and nearly level, rising by a gentle slope to a plateau of 600 to 1,000 feet in the interior. There are a number of shallow lakes, including Eyre, Torrens, Gardiner and Everard. These are partially salt. The Murray River flows through the southeastern part and is the only stream of importance in the state.

The climate is hot, but usually healthful. Along the coast there is considerable rainfall, but in the interior the rainfall is often not more than ten, and sometimes only five inches. For these reasons agriculture is confined chiefly to the southeastern section.

Agriculture forms the chief industry of the inhabitants. Wheat is the most important crop, followed by barley and oats. Large quantities of oranges, grapes and other fruits are grown, and the manufacture of wine has become an industry of considerable importance.

Copper, silver and gold are found in the mountains. The first gold mine in Australia was opened in South Australia, but copper is now mined in larger quantities than any other metal. Silver and lead are mined in small quantities, and iron, stone, phosphate rock, salt, kaolin, gypsum and other minerals occur. There are about 2,700 miles of railways in the state.

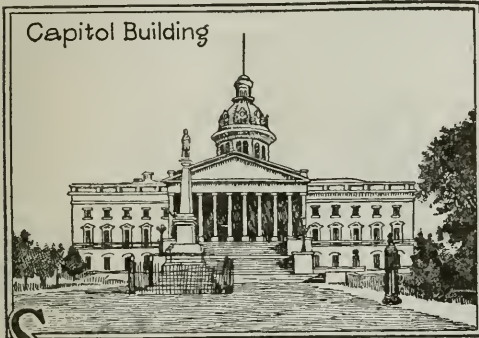
The executive department consists of a governor, appointed by the Crown, and a council consisting of six ministers and the chief justice of the supreme court. The legislature comprises two bodies—the legislative council, consisting of twenty members, and the house of assembly, of forty-six members, all elected by popular suffrage for three years, the right to vote being extended to women. Elementary education is free and compulsory upon children up to the age of thirteen. Adelaide is the capital. Population, 1917, (estimated), 429,950.

Related Articles. Consult the following titles for additional information:
Adelaide Australia Murray River

SOUTH BEND, IND., the county seat of Saint Joseph County, eighty-six miles southeast of Chicago, on the Saint Joseph River and on the Grand Trunk, the New York Central, the New Jersey, Indiana & Illinois, the Lake Erie & Western, the Michigan Central and the Vandalia railroads. The University of Notre Dame and Saint Mary's Academy are located two miles north of the city. Some of the important institutions of South Bend are the Saint Joseph's Academy, the Northern Indiana Medical and Surgical Institute, two hospitals and ten banks. Other important structures are the Federal and county buildings, a city hall, a public library, and a Y. M. C. A. building. The city is surrounded by rich farming region and is the chief industrial center of Northern Indiana. It has the largest wagon factories in the country. Other manufactures are plows, clover hullers, sewing machines, flour, woolen goods, watches, cutlery, electrical appliances, and concrete blocks. The value of the annual output of all factories approximates \$60,000,000. The first white settlement was made by Alexis Coquillard in 1824. The town was incorporated in 1835, and the city was chartered in 1865. Population, 1910, 53,684; in 1917, 70,967 (Federal estimate).

SOUTH BETHLEHEM, PA., a borough in Northampton County, forty miles north of Philadelphia, on the Lehigh River, opposite Bethlehem, and on the Lehigh Valley, the Philadelphia & Reading, the Central of New Jersey and several electric railways. It has good transportation facilities, is near deposits of coal and iron ore, and contains extensive iron and steel works, machine shops, foundries, zinc and brass works, wood-working establishments and other factories. Lehigh

University is located here, and the borough also contains the Bishop Thorp Seminary for girls, the Saint Luke's Hospital, and public and school libraries. Population, 1910, 19,973; in 1917, 24,886 (Federal estimate).



SOUTH CAROLINA, one of the South Atlantic group of American states, lying between North Carolina and Georgia and bordered for 190 miles by the Atlantic Ocean. In the city of Charleston it possesses one of the country's great ocean ports. The form of the state is roughly triangular, and it has an area of 30,989 square miles, which ranks it as the thirty-ninth state in size. In 1910 the population was 1,515,400, the state being twenty-sixth in population. Of this number 835,843 were negroes. In 1918 a Federal estimate increased the population to 1,660,934. The popular name of South Carolina is the *Palmetto State*.

Surface and Drainage. South Carolina has three natural divisions of surface, known respectively as the "low country," the "middle country" and the "up country." The first division consists of low lands along the coast, extending in some places a hundred miles inland. Most of this region is but a few feet above sea level, and low islands and salt marshes border the coast. The "middle country" consists of rolling land, broken occasionally by sandhills. Along the western border of this region is a belt of sandhills partially covered with pine forests, and known as the "Pine Barrens." Beyond this the country rises abruptly to the Piedmont plain. The "up country" includes the northern and western parts of the state, and is rich in minerals. In the northwest the Blue Ridge Mountains rise abruptly to a height of over 2,000 feet above the plateau; Mount Rich, in the northwestern part, with an altitude of 3,569 feet, is the highest point.

The drainage is to the southeast. The principal rivers are the Savannah, the Pedee, the Congaree and the Santee. Below the Fall Line these streams are deep and sluggish. At the Fall Line and above they furnish abundant water power, and cities with thriving manufacturing industries are found on them.

Climate. South Carolina has a delightful climate. The winters are short, seldom lasting longer than six weeks. The summers, while long, are not usually hot or enervating, and the nights are always cool. Snow falls only in the mountains. The average annual temperature is 63°; the average rainfall, 52.31 inches.

Mineral Resources. The mineral resources of South Carolina are extensive and varied. The mineral yielding the greatest income in years past has been phosphate rock, but its quantity has greatly decreased. Clay products are worth close to a million dollars a year. Considerable building stone is quarried, and gold is mined in a few localities; with an annual output of about \$7,500,000. There are also some silver and a little lead. Kaolin is found, and there are deposits of iron ore, marble, granite, asbestos, soapstone and mica. The mineral fuels include a little gas, petroleum and coal. There is granite in the Piedmont sandhills.

Agriculture. South Carolina is an agricultural state. The chief products are cotton, rice, tobacco, corn and oats. The state is fifth in the production of rice; it is fourth in the production of cotton, the yield being nearly 1,400,000 bales annually. The sea-island cotton is the best in the world, and it is produced in large quantities in the strip of islands near the coast. Corn is raised to the extent of 40,000,000 to 45,000,000 bushels a year; oats, about 10,000,000 bushels; wheat, about 2,000,000 bushels; tobacco, over 50,000,000 pounds. Truck gardening and fruit growing are rapidly developing industries. Watermelons are grown in abundance, peaches are cultivated in the Piedmont section, and olives and oranges grow along the coast. Among native fruits are apples, pears, quinces, plums, apricots, almonds and cherries. The hillsides of the Piedmont section are covered with fine vineyards. There are extensive pine and cypress forests in the mountain section and in the low country.

Manufactures. Nearly one-half the annual products of South Carolina now consist of

manufactured goods, and these are made in about 2,000 factories. Cotton manufacturing is by far the most important industry, the state being second among the Southern states in the value of cotton products. The manufacture of lumber and timber products ranks second. Other industries are the manufac-

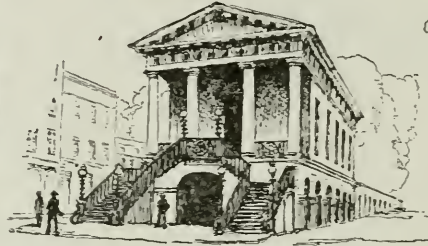
Government. The legislature consists of a senate, containing forty-four members, elected for four years, one-half retiring every two years, and a house of representatives of 124 members, elected for two years. The executive department consists of a governor, a lieutenant-governor, a secretary of

SOUTH CAROLINA

THE PALMETTO STATE



State Seal



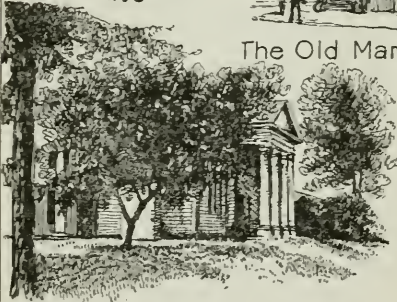
The Old Market at Charleston



Population of Cities

- ◆ 9,000 to 15,000
- ▲ 16,000 to 20,000
- 21,000 to 25,000
- ★ 30,000 to 40,000
- Over 60,000

A Rice Field



Calhoun's Home, Charleston



ture of fertilizers, of cottonseed oil and of naval stores. There are extensive fisheries at Charleston, Georgetown, Beaufort and Port Royal.

Transportation. The Savannah, the Pedee, the Congaree and the Santee are navigable to the Fall Line. The mouths of these rivers form good harbors, and there is an excellent harbor at Charleston. The state is well supplied with railroads, which traverse it from the northeast to the southwest and from the northwest to the southeast. The entire mileage exceeds 4,500 miles, and with the exception of the counties along the coast the state is well provided with railroad facilities. The lines are practically under the control of three systems, the Atlantic Coast Line, the Seaboard Air Line and the Southern. Charleston has an important foreign trade.

state, a comptroller-general, an attorney-general, a treasurer, an adjutant-general and a superintendent of education, each elected for two years. Numerous commissions and boards are named by the legislature or by the governor. The courts comprise a supreme court of one chief justice and four associates, elected by the general assembly for ten years, and a circuit court for each judicial circuit into which the state is divided. The judges for the circuit courts are elected by the legislature for four years.

Education. Marked improvement has been made in the school system within the past few years. Separate schools are maintained for the white and colored races. The South Carolina Historical Society, founded at Charleston in 1855, has a valuable library and some important manuscripts. The state

Items of Interest on South Carolina

South Carolina is the only state in which divorce is not allowed under any circumstances; this is a provision of the state constitution.

The tree and plant life is semi-tropical in character on the coast islands, where the palmetto, live oak, and magnolia are common; in the Coastal Plain the long-leaf pine predominates in the sandy regions while the cypress is commonest in the swamps; in the uplands, pines, oaks and hickories, as well as elms, maples, and chestnuts, are found everywhere.

Medicinal and flowering plants are abundant; a few of the former are ginseng, snakeroot, bloodroot, horehound and wild flax; of the latter the most prominent are jessamines, azaleas, lilies, roses, violets, honeysuckle and goldenrod.

Any officer, state, county, or municipal, "who, through negligence or connivance, permits a prisoner to be seized and lynched," forfeits his office and becomes ineligible to hold any public office or trust in the state unless pardoned by the governor; the county in which the crime occurs is, without regard to the conduct of the officer, liable for damages of not less than \$2,000 to the heir or representative of the person lynched, and the county is authorized to collect the amount from the persons engaged in the lynching.

Questions on South Carolina

What is the area of South Carolina? Describe its surface.

What is the highest point in the state?

What are the principal rivers?

What is the character of the tree and plant life?

What percentage of the total area is covered by forests?

Name some of the common flowers, song birds and other animals.

How many farms are there in South Carolina?

What are the principal crops?

What is the most important product of the fisheries?

university is at Columbia. Among other institutions of learning for white students are the following:

Chicora College, Greenville.
Clemson Agricultural College, Clemson College.

Coker College, Hartsville.
College of Charleston, Charleston.
Columbia College, Columbia.
Converse College for Women, Spartanburg.
Erskine College, Due West.
Furman University, Greenville.
Greenville Female College, Greenville.
Lander College, Greenwood.
Newberry College, Newberry.
Presbyterian College, Clinton.
Winthrop Normal College, Rock Hill.
Wofford College, Spartanburg.
Women's College, Due West.

There are schools for the education of colored students at Denmark, Ermo, Rock Hill, Orangeburg, Abbeville and Columbia.

State Institutions. In 1915 a state board of corrections and charities was provided. It has supervision of a penitentiary and a reformatory for young negro boys at Columbia, an industrial school at Florence, a state farm at Boykin, a state hospital for the insane and an infirmary for Confederate soldiers, the latter two at Columbia.

Cities. There are six cities in the state with populations exceeding 8,000. These are Charleston, Columbia, Spartanburg, Greenville, Anderson and Sumter. Columbia is the capital.

History. In 1562 French Huguenots settled at Port Royal, S. C., but the colony was dispersed by the Spaniards, and settlement was not again attempted in the territory for nearly a hundred years. In 1663 it was granted by the king of England to eight proprietors, and the first permanent settlement was made on the Ashley River, but it was later removed to Charleston. In 1729 the proprietors of the Carolinas, which had been governed together, sold their interest to the Crown, and the region was divided into two separate rovinces.

During the eighteenth century, South Carolina maintained a semi-independence of the Crown and was aggressively patriotic during the pre-Revolutionary struggle, being the first state to form an independent constitution (May, 1776). Many of the most important battles of the war occurred within its borders, and it also furnished famous commanders, among whom were Thomas Sumter and Francis Marion. The Federal Constitu-

tion was ratified after somewhat bitter discussion, in May, 1788.

South Carolina was always strongly Anti-Federalist in sentiment, and it came into serious collision with the national government on the passage of the Clay tariff act in 1832, secession being averted only by compromise. It was the first state to secede preceding the outbreak of the Civil War (December 20, 1860), and the first battle of the war was fought at Fort Sumter in the following April. Though the voting population of the state was but 47,000, it furnished 60,000 men to the Confederate army, of whom one-fifth were killed. It refused to ratify the Fourteenth Amendment, but adopted a constitution allowing negro suffrage, and was readmitted to the Union, on June 25, 1868. It suffered especially under the carpetbag régime, the state debt being increased from five to twenty million dollars in five years.

Among recent incidents in its history have been the Charleston earthquake, August 31, 1886; a famous storm and tidal wave in 1893, and the South Carolina and West Indian Exposition of 1901 and 1902. It has been consistently Democratic in both state and national politics. In 1916 provision was made to organize the militia in conformity with national requirements. It was made a crime to sell a formula for intoxicating beverages or to dispose of distilling apparatus. Children may not work in factories until fourteen years of age.

Related Articles. Consult the following titles for additional information:

CITIES

Anderson	Columbia	Spartanburg
Charleston	Greenville	Sumter

HISTORY

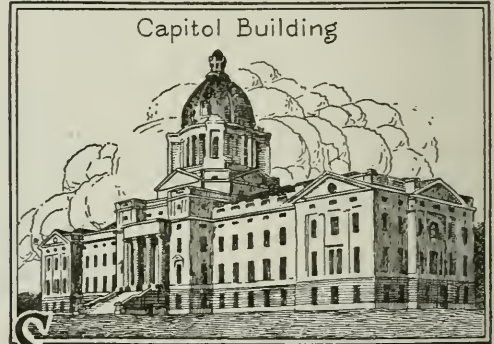
Calhoun, John C.	Ku-Klux Klan
Carpetbaggers	Nullification
Fort Moultrie	Reconstruction
Fort Sumter	States' Rights

PHYSICAL FEATURES

Blue Ridge	Piedmont Region
Fall Line	Savannah River

SOUTH CAROLINA, UNIVERSITY OF, a co-educational state institution located at Columbia. It was founded as the South Carolina College in 1801, and was opened in 1805. Before the Civil War it was one of the most advanced colleges in the Union. During the war the college was closed and the buildings were used as a hospital, first by the Confederates and later by the Federals. Reopened as a university in 1866, it was closed again after a few years in

consequence of unsettled political conditions, until 1880, when it was organized as a college. Since its last reorganization in 1906 as the University of South Carolina it has experienced rapid development, and now includes schools of art, science, engineering and law, a school for teachers and a graduate school, with also extended elective courses of study. The faculty numbers about forty, and there are over 600 students. The library includes about 50,000 volumes.



SOUTH DAKOTA, popularly called **THE SUNSHINE STATE**, because of its many bright, sunny days, is a great agricultural state of the American Union, belonging to the north-central group. Originally it was a part of Dakota Territory, the land of the Dakota tribe of Siouan Indians. The name Dakota is the Indian for *Allies*, and refers to the membership of the Dakotas in the Sioux Confederation.

Location and Area. South Dakota is bounded on the north and south by North Dakota and Nebraska, respectively. The Missouri River, which flows entirely across it in a general southeasterly direction, forms a portion of its boundary on the south. On the west South Dakota adjoins Montana and Wyoming, and on the east it borders on Minnesota and Iowa. In general it is rectangular in shape.

With an area of 77,615 square miles, of which 747 square miles are water, South Dakota is the fourteenth state in the Union in size. North Dakota is smaller by nearly 7,000 square miles, and Nebraska by ninety-five.

Population and Cities. In 1910, when it had 583,888 inhabitants, South Dakota was the thirty-sixth state in the Union in population. Germans, Scandinavians, Russians and Irish are the most numerous of the foreign-

born groups, who constitute about sixteen per cent of the population. In 1918, according to Federal estimates, the population was 735,434. There are six Indian reservations, with a total area of 670 square miles. In 1916 they were peopled by 21,237 Indians.

The chief cities, in order of size, are Sioux Falls (population, 16,887 in 1917), Aberdeen (15,926), Lead (9,984), Watertown, Mitchell, Huron and Yankton. Pierre is the capital.

Surface and Drainage. The surface for the most part is a gently-undulating prairie, rising from a plain east of the Missouri River to a plateau in the western portion of the state and to the Black Hills in the southwest. Two long and narrow tablelands, from 1,500 to 2,000 feet above sea level, covered in places with boulder-strewn hills, extend nearly north and south; one, the Coteau des Prairies, is near the eastern border, and the other, the Coteau du Missouri, lies just east of the Missouri River. Between these plateaus is the basin of the James River. West of the Missouri River the surface is more uneven, and hills and buttes are numerous. All of this region is drained by branches of the Missouri. The Black Hills region comprises an area of about 5,000 square miles, extending into Wyoming. The highest point is Harney Peak, 7,216 feet in altitude. The central zone is of granite, and around it are rows of hills made in the upturned edges of sedimentary rock layers.

To the southeast of the Black Hills are the famous Bad Lands, though the name is misleading, for it is simply the abbreviation for "bad-for-traveling lands," as the early French explorers called them. This region is made up of soft clays, marls, shales and sands, in which the forces of erosion have produced deep, steep-walled gulches and ravines, and numerous hills and buttes. In the broader valleys, where the slope is not so steep, nutritious grasses grow. The North Dakota bad lands extend into the northwestern part of the state. These clays are more highly colored and the scenery is more beautiful than in the southwest.

The state is drained by the Missouri River system. The Missouri itself flows through the state in a southeasterly direction. Parallel to the Missouri and 100 miles east is its tributary, the James River. The remaining principal tributaries of the Missouri all enter from the west; in order, from north to south, they are the Little Missouri, the Cannon Ball,

the Grand, the Owl, or Moreau, the Big Cheyenne and the White. All the rivers flow toward the southeastern corner of the state, and a part of the eastern boundary is formed by the Big Sioux, on which Sioux Falls is located.

Climate. The climate, being continental, is characterized by extremes of heat and cold, but as the air is clear and dry, the heat of summer and the cold of winter are not so uncomfortable as in states to the east where the air is damp. The average annual temperature of the east half of the state is 44.5° of the west half, 45.6°. The mean annual rainfall for the eastern half of the state is 22.3 inches, and for the western half, 17.3 inches. The unusual amount of sunshine and the invigorating qualities of the air make the climate very healthful.

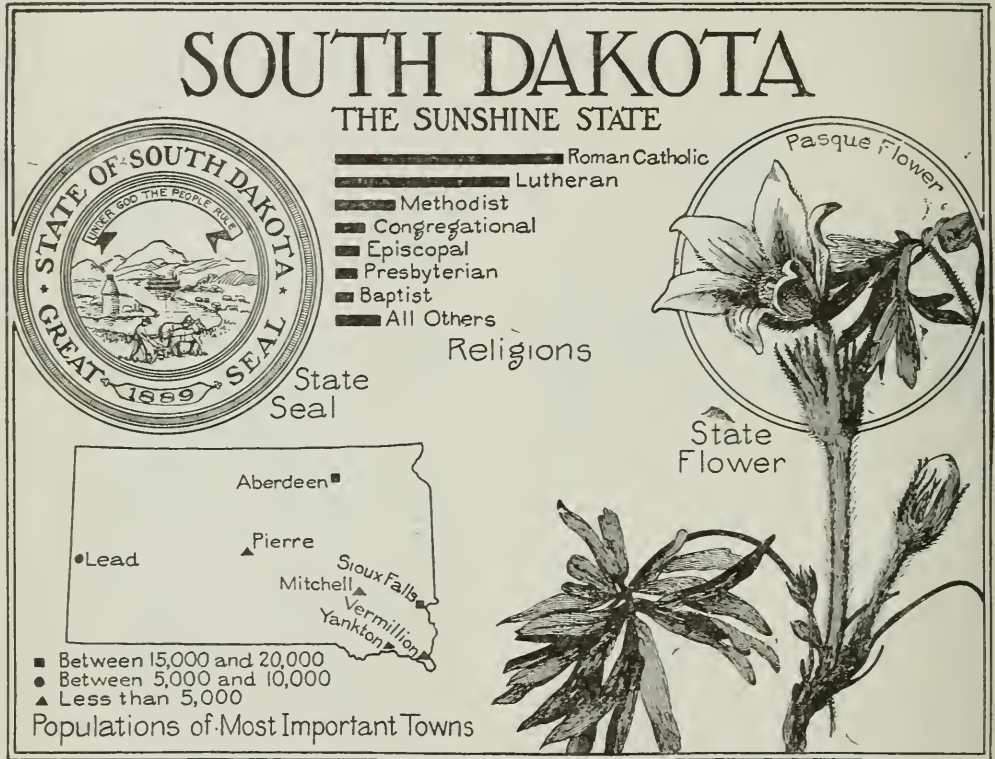
Mineral Resources. The Black Hills are said to comprise the richest 100 square miles on earth, yielding about one-twelfth of the gold produced by the United States each year, and giving South Dakota fourth place in the list of gold-producing states. The annual output now averages more than \$7,400,000. Silver, mica, lead, tungsten, tin, copper, iron, manganese, graphite, and other rare and valuable minerals are also found in this region. Here, too, are found valuable limestone, granite, sandstone, marble and gypsum. Excellent building and paving stone, called red quartzite, known also as Sioux Falls jasper, is quarried at Sioux Falls and Dell Rapids along the Big Sioux River. Cement is manufactured from the beds of chalkstone near Yankton, and great quantities of excellent brick and fire clays are found.

Agriculture. The rich plains of the eastern half of the state have been famous for years for wheat, corn and other farm products, and the grazing plains of the western portion for live stock. With the advent of railroads into the western plains and the application of improved "dry farming" methods, the entire state is fast becoming agricultural. Irrigation is practiced to some extent in the vicinity of the Black Hills, especially in the valley of the Belle Fourche River. Wheat and corn are the most profitable crops, and the acreage devoted to each is over three and one-half million. Oats, barley, potatoes, hay, flaxseed, apples and small fruits are also valuable products. In the production of spring wheat, South Dakota is one of the three leading states, the others being Min-

nesota and North Dakota; it is the fourth in the production of flaxseed, following North Dakota, Minnesota and Montana.

Manufacture. The chief manufacturing industries are connected with the agricultural activities, and include the making of butter, cheese and condensed milk, and flour and grist milling. Printing and publishing, the manufacture of lumber and lumber products

representatives of not fewer than seventy-five nor more than 135 members. The sessions are biennial and are limited to sessions of sixty days, except in cases of impeachment. The executive department consists of a governor, a lieutenant-governor, a secretary of state, a treasurer, a superintendent of public instruction, a commissioner of schools and public lands, a commissioner of insurance, an



and the production of various commodities for home needs are other lines of manufacture. Sioux Falls is an important meat-packing center. Between 1910 and 1915 the value of manufactured products increased over thirty-five per cent.

Transportation. Railroads reach all parts of the state, and new lines are being built in the newer sections. The total mileage is about 4,300. The important roads are the Chicago, Milwaukee & Saint Paul; the Chicago & North Western; the Chicago, Burlington & Quincy; the Illinois Central; the Great Northern and the Chicago, Rock Island & Pacific.

Government. The legislature consists of a senate of not fewer than twenty-five nor more than forty-five members, and a house of

adjutant-general and an attorney-general, all elected for two years. The courts consist of the supreme court, consisting of five judges elected for six years, and state district courts, one in each district, presided over by judges elected for four years. County judges are elected, one in each county, for two years. Capital punishment was abolished in 1915, and since then other progressive laws have been passed, including legislation prohibiting the liquor traffic, granting women the right to vote and providing for workmen's compensation.

Education. The state educational institutions are controlled by a board of regents consisting of five members appointed by the governor for a term of six years. These com-

Items of Interest on South Dakota

The Indian reservations are the Standing Rock, Cheyenne River, Lower Brule, Crow Creek, Pine Ridge and Rosebud.

The state is governed under its original constitution of 1889, but this has been amended several times.

South Dakota was the first state in the Union to adopt the initiative and referendum: under the constitutional amendment of 1898, on petition of five per cent of the legal voters the legislature must submit to popular vote at the next general election measures which they wish enacted as such, or measures already passed by the legislature which have not already become effective.

The governor's veto does not apply to laws passed by popular vote.

Elementary agriculture was added to the studies in all rural schools in 1909.

When the state was admitted into the Union two sections of land, 640 acres each, were set aside to be sold for school purposes.

The first national bank in the state was organized at Yankton in 1872.

The first authentic reports of explorations in the Dakotas were made by the Lewis and Clark expedition in 1804 and 1806; other explorers were John C. Fremont in 1838, and John J. Audubon in 1843.

The only extensive forest region is in the Black Hills, where there is a national forest reserve of 1,129,208 acres.

Questions on South Dakota

What is the area of South Dakota? How does it rank in size among the states?

What was the percentage increase in population between 1910 and 1918?

What is the origin of the name "Bad Lands"?

Describe the drainage system of the state.

What is the chief mineral, and what is the state's rank in its production?

How does South Dakota rank in the production of spring wheat? Flaxseed?

prise the state university, located at Vermilion; the state college of agriculture and mechanic arts, located at Brookings; the state school of mines, located at Rapid City; the northern normal and industrial school, located at Aberdeen; and three state normal schools, located at Madison, Spearfish and Springfield. There are also denominational schools of higher education. The common schools of the state are supported from the interest on the investment of funds derived from the sale of school lands, from a local tax, a general tax and from other sources. Attendance is compulsory for those between the ages of eight and sixteen.

Institutions. The leading institutions are the insane asylum at Yankton, a school for the feeble-minded at Redfield, schools for deaf mutes and blind at Sioux Falls, an institution for the blind at Gary, a soldiers' home at Hot Springs, a tuberculosis sanitarium at Custer, a reform school at Plankinton and a penitentiary at Sioux Falls.

History. For the early history of South Dakota, see NORTH DAKOTA, subhead *History*. The state of South Dakota was formed by the division of Dakota Territory in November, 1889, after a great immigration to the region had caused it to become important as a wheat-producing territory. Since its admission into the Union, the state has progressed rapidly along all lines of development.

Related Articles. Consult the following titles for additional information:

CITIES AND TOWNS

Aberdeen	Mitchell	Sioux Falls
Lead	Pierre	Yankton

HILLS AND RIVERS

Bad Lands	Minnesota River
Black Hills	Missouri River

HISTORY

Custer, George A.	Miles, Nelson A.
Lewis and Clark Expedition	Sitting Bull

SOUTH DAKOTA, UNIVERSITY OF, a coeducational state institution for higher learning, founded at Vermilion in 1882 under the name of the University of Dakota. When the territory was divided into North and South Dakota and these states were admitted to the Union, the name was changed to that which the institution now bears. The present organization includes a collegiate department, also colleges of law, medicine, music and commerce, and a preparatory department. The collegiate department has courses in classics, literature, civil and mechanical engineering and sciences, and it has control of the state geological survey. The faculty numbers over

sixty, and there is an enrollment of nearly 700 students. Its library contains over 31,000 volumes.

SOUTHERN CROSS, a constellation of the Southern hemisphere, consisting of four stars in the same relation to one another as the ends of a somewhat irregular cross. The lowest star of the group is of the first magnitude, the northern and eastern are of the second magnitude, and the western of the third. The imaginary upright bar of the cross points to the South Pole.

SOUTHEY, ROBERT (1774-1843), an English poet and miscellaneous writer, the son of a linen draper of Bristol. He was sent to Westminster School in 1788 and soon gave proof of distinguished talents; but he was dismissed in 1792 for a satirical paper on flogging, published in a school journal. Shortly afterward he entered Balliol College, Oxford, where he remained but two years. He formed an acquaintance with Coleridge, and they were married on the same day to two sisters; but the scheme for the founding of an ideal community on the banks of the Susquehanna, in the carrying out of which their marriage was the first step, failed for lack of funds. In 1804 Southey fixed his permanent residence at Greta, near Keswick, in the heart of the English lake district, where he had Wordsworth and Coleridge for neighbors. From this period his intellectual activity was untiring, and he continued for a period of almost forty years to issue annually at least one, and often several, works, besides contributing largely to different periodicals. A government pension of £160 (\$800) was allowed him in 1807, and this was increased in 1835 to £460 (\$2,300). In 1813 he was appointed poet laureate. Having lost his first wife, he married, in 1839, Caroline Anne Bowles, herself a writer of some eminence. Soon afterward he sank into a state of imbecility, from which he did not recover. Among his poetical productions may be mentioned *Joan of Arc*, *Thalaba*, *Madoc*, *The Curse of Kehama*, *Roderick*, *the Last of the Goths* and a *Vision of Judgment*. His prose writings, including his letters, are models of literary expression. *Life of Nelson*, *Life of Wesley*, *History of Brazil* and *The Doctor* are among those still read for their lucid and beautiful style.

SOUTH MOUNTAIN, BATTLE OF, a battle fought September 14, 1862, near Sharpsburg, Md., between a Confederate force of 18,000

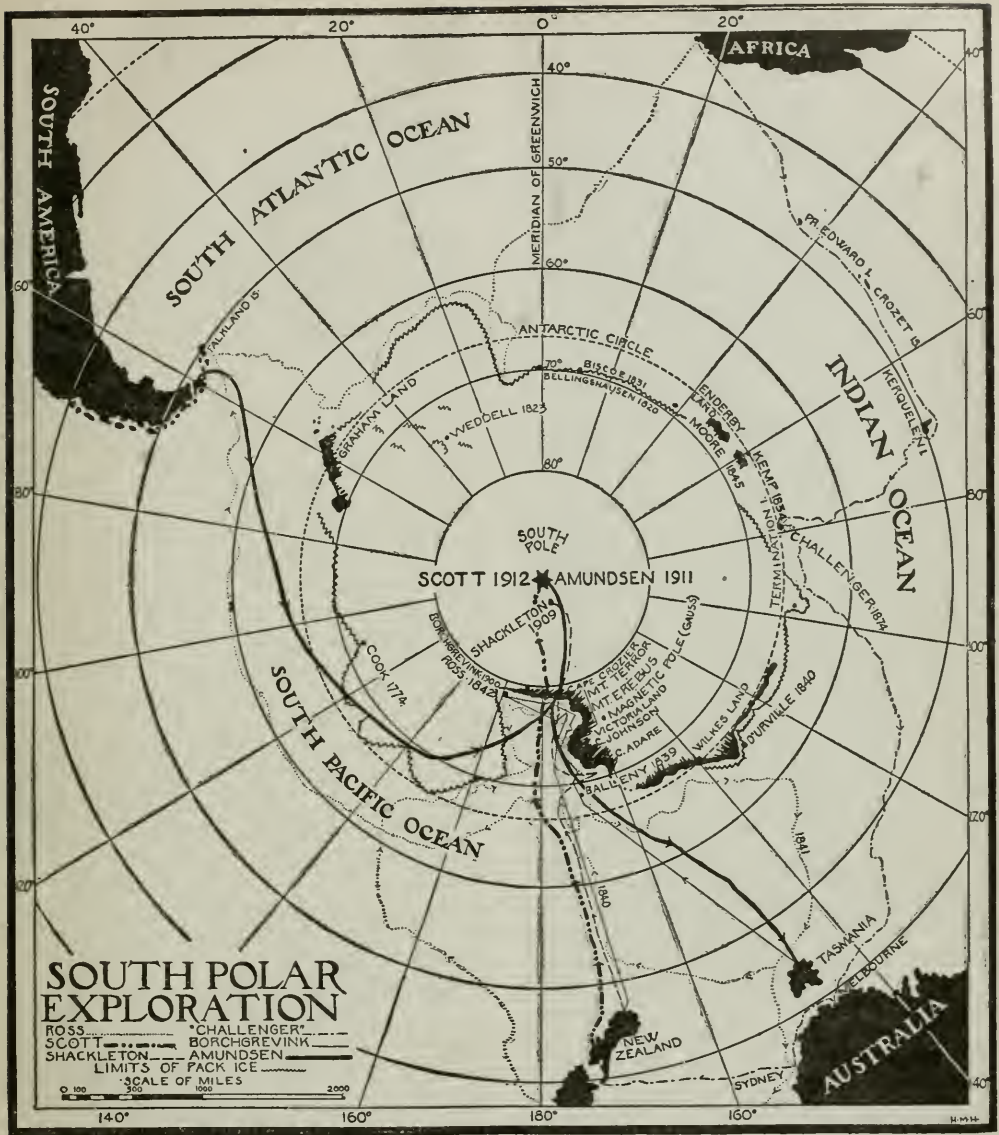
from Lee's Army of Northern Virginia and a Federal force of 28,000 from McClellan's Army of the Potomac. The Confederates were compelled to retreat, after offering a stubborn resistance, and took up a position along Antietam Creek, where another severe battle was fought September 16. The losses at South Mountain were, of the Federals, 1,800, of the Confederates, 2,600.



SOUTH POLAR EXPLORATION. Previous to the latter half of the nineteenth century comparatively little attention was given to exploration in the Antarctic regions. The first navigator known to have crossed the Antarctic Circle was Captain James Cook, who in 1773-'74 explored a portion of the land mass sur-

rounding the South Pole. Later explorations confirmed Cook's discovery, and existence of the continent of Antarctica is now undisputed. While the shoreline of this great land mass has not been fully surveyed, it is estimated to have an area of over 5,000,000 square miles, making it about twice the size of Australia. It has an average elevation of 2,000 feet and mountains exceeding 15,000 feet in altitude. Different sections of this continent have been discovered by various explorers, each believing that he had found a separate land mass, and giving it a distinct name, so we find on the south polar maps Wilkes Land, South Victoria Land, King Edward VII Land, etc., all probably belonging to one great land mass.

Discovery of the South Pole. Captain Roald Amundsen, a Norwegian navigator, discovered the South Pole on December 16, 1911. Amundsen set sail from Norway in the *Fram* in 1910, with the intention of passing around Cape Horn, and entering the Arctic Ocean through Bering Strait, where he intended to spend several years in scientific investigation. But he changed his mind, and when he reached Cape Horn he turned southward. Reaching land in January, 1911, he established headquarters on the ice cap and lived there during the winter. Several supply stations were located on the route which the explorers were to follow. On October 21, Amundsen, with four companions, fifty-two dogs and four sledges, started for



the Pole, which was reached without mishap on December 16. Their journey was over a plateau from 3,000 to 11,000 feet high. Amundsen erected a tent at the Pole, and raised the Norwegian flag. He named the land King Haakon VII Plateau. The expedition reached headquarters January 12, after an absence of ninety-nine days.

Scott's Expedition. Captain Robert F. Scott of England, who in 1900 had made valuable explorations in the Antarctic regions, started on his second expedition at about the same time as Amundsen. Both

parties were striving at the same time to reach the Pole, though by different routes and unknown to each other. Scott reached the Pole January 18, 1912, where he found Amundsen's tent and flag. On their return to headquarters the entire party of five died from privation and exposure. The scientific results of this expedition were of high value.

Shackleton's Expedition. In 1909 Lieutenant (now Sir Ernest) Shackleton commanded an expedition which made valuable explorations in the Antarctic regions.

Shackleton ascended Mount Erebus, an active volcano, which he found to have an altitude of 13,379 feet and a crater 900 feet deep. On another journey Shackleton went within 111 miles of the Pole, when the company was compelled to turn back because of lack of supplies. Although Shackleton did not reach the Pole, it is generally conceded that his expedition solved the South Polar problem. Several side expeditions by Shackleton's party collected valuable scientific data. On his return he lectured to large audiences in the leading cities of the United States and Canada. A second expedition, from which he returned in 1917, had for its purpose the crossing of the Antarctic continent from Weddell Sea to Ross Sea. The expedition left Buenos Aires October 27, 1914, in the *Endurance*. Their ship was caught in the ice pack and was finally crushed and sunk. After enduring almost incredible hardships the party was saved by a reserve ship which Shackleton secured by making a voyage of 750 miles to New Zealand in a small boat.

Other Recent Expeditions. During the period covered by the expeditions described above, a number of other expeditions were made to the South Polar regions. While none made any new discoveries of striking importance, each contributed something of value to the knowledge of this vast unknown region, and the combined information obtained by them was of great value to geographic science.

Early Expeditions. Captain Cook is the first who is known to have sailed within the Antarctic Circle. He reached the southernmost point attained by him, on Jan. 30, 1774, $71^{\circ} 10'$ south and 107° west. In 1821 Bellinghausen, the Russian, discovered Peter the Great and Alexander islands. Enderby Land and Kemp Land were discovered by Biscoe in 1831-1833. The first of these is the easternmost point of a supposed continuous coast and lies in about latitude $67^{\circ} 30'$. Sabrina Land and Balleny Islands were discovered in nearly the same latitude by Balleny in 1839. In 1840 two important exploring expeditions, one American, the other French, reached the Southern seas. The American expedition, under Wilkes, passed very near the southern magnetic pole, the position of which, at the time, he calculated to be 70° south latitude and 140° east longitude; it also traced land from longitude $154^{\circ} 27'$ to $97^{\circ} 30'$ east, which Wilkes concluded to be continuous. The French expedition,

under Dumont d'Urville, found traces of what they believed to be a continuous coast from 136° to 142° east, to which they gave the name of Adelie Land. An English expedition under James Clark Ross in 1839 passed the Antarctic Circle in about longitude 178° east, and in $172^{\circ} 36'$ east longitude and $70^{\circ} 41'$ south latitude he found a continuous coast, trending south, with mountain peaks 9,000 to 12,000 feet in height. He gave the country the name of South Victoria Land. In $77^{\circ} 32'$ south latitude, 167° east longitude, he discovered an active volcano, Mount Erebus.

Related Articles. Consult the following titles for additional information:

Antarctic Ocean	Scott, Robert Fulton
Amundsen, Roald	Shackleton, Ernest H.

SOUTH SEA COMPANY, a company organized in England in 1711 by the lord treasurer Harley, with the exclusive right to trade in what was then known as the South Sea. In less than ten years after its establishment, the South Sea Company had taken over the entire national debt, which had by that time become £30,000,000. A number of the directors of the company began to dispose of their shares in 1720, and the weakened confidence which resulted from this, together with the failure of Law's Mississippi Scheme in France, brought about the collapse of the entire scheme. Thousands of shareholders were ruined. On investigation, the company was found to be fraudulent; the property of the directors was seized, and approximately a third of the original investment was returned to the stockholders.

SOVEREIGN, *sov'ur in*, a gold coin in current use in England, the value of which is £1, and the weight 123.274 grains troy. It is .916 pure metal. Half-sovereigns, 2-pound pieces and 5-pound pieces are also coined in the same proportion of weight and purity. The crown is equal to a quarter-sovereign. The sovereign of to-day bears the likeness of the ruler.

The sovereign is equivalent to about \$4.87 in United States and Canadian money.

Related Articles. Consult the following titles for additional information:

Crown	Guinea	Pound
Farthing	Penny	Shilling

SOVEREIGNTY, *sov'er in ti*. The word *sovereignty* is used in two different senses—to denote what is technically called *internal* sovereignty, that is, supremacy over the citizens of a state and to denote *external* sovereignty, that is, complete independence of any

other state. When used with reference to the internal affairs of a state, sovereignty may be either *legal* or *political*. The latter refers to the power which has ultimate control over all the state activities; thus, in the United States the people would be the political sovereign. Legal sovereignty refers to the organ of government which expresses the will of the political sovereign.

Characteristics of Sovereignty. Internal sovereignty has certain attributes: (1) It is *absolute*, that is, there can be no limitation upon its powers or activities. Practically, no government has absolute internal sovereignty, since every modern government is limited, either by a constitution or by some act or decree which granted rights which by prescription or for some other cause are now inviolable. (2) Sovereignty is said to be *indivisible*, that is, there cannot be two sovereigns with authority over the same territory. In a federal government either the whole people are the sovereign, and the state and central governments are the instruments of its sovereignty, or each state is a sovereign and the central government acts only in certain matters for the general good. An externally sovereign state theoretically is one which is absolutely independent of all other states. However, in practice this is impossible, and states which have practically surrendered every power in their relation to other states are still considered sovereign. See STATE; GOVERNMENT.

SOVIET, a Russian term meaning *committee*, or *local council*, which came into general use at the time of the revolution which overthrew the imperial government. When the czar was forced to abdicate, soviets by hundreds came into existence over the country, in villages, factories, among the soldiers, etc. These soviets assumed authority as administrative bodies, and in course of time they became the real source of power, forcing Kerensky out of the government and giving the leadership to Lenine. The Russian soviet government is the executive committee of a vast number of village, town and city soviets. For details of this movement, see RUSSIA, subhead *The Soviets*.

SOWING, *so'ing*, **MACHINE**, **SEEDER**, or **DRILL**, a machine for planting grain. Among the simplest and earliest forms of this machine is a cylindrical vessel, with small holes at regular intervals around its circumference. This was used for sowing

round seeds, such as turnip seed. The machine was placed on wheels and was drawn over the land at a regulated speed; by its mere rotation the seed was delivered with considerable uniformity. A later pattern of machine had a fixed seed box, from which the delivery of the seeds was regulated by a revolving brush.

The pattern of seeder in most common use for wheat, oats and other small grains is the *drill*. This consists of a narrow box, eight or ten feet long, with circular openings in the bottom, from three to four inches apart. Connected with each of these openings is a hollow iron tube, extending down to the ground. In front of each tube is a device for making a small furrow, called the *lister*, consisting of two thin, flat pieces of steel, which meet in front and turn upward with a curve. Back of each lister is a wheel or other device for covering the grain. The box contains a revolving brush, for the purpose of distributing the grain evenly through the holes in the bottom. This can be gauged so as to allow any quantity to pass through and is thus adaptable for the sowing of different grains. As the machine is moved forward the brush revolves, and the grain falls through the drills into the furrows. A team of two horses can operate one of these drills, and on good ground it will seed from eight to ten acres in a day.

SOW THISTLE, *sou this'el*, a European weed belonging to the composite family, several species of which have been introduced into America. In parts of Europe it is used by the peasantry as a vegetable. The most common species grows to a height of two or three feet and has a branching stem and small yellow flowers, about three quarters of an inch in diameter. It spreads very rapidly, by means of its creeping roots and light seeds, blown about by the wind, and is a nuisance in pastures and grain fields. It can be eradicated only by careful cultivation and by planting other crops to smother its growth.

SOY BEAN, a bushy plant from two to four feet high. In Asia, where it is native, and especially in China and Japan, it constitutes an important article of diet, being used in the preparation of a number of fermented products, such as tofu cheese, which there takes the place of meats and other expensive nitrogenous foods. In America and in parts of Europe the soy bean is cultivated chiefly as a forage plant. As fodder the

plant, when cut at the proper time and cured, has a high food value. If the soy bean is planted for fodder the seed is sown broadcast and the plant is cut while in bloom; if it is planted for beans, the seed is sown in drills about three feet apart, and the plant is cut just before time for the pods to burst and scatter the seeds. From eight to ten bushels an acre is an average yield for green forage, while fifty bushels and more of seeds can be produced from an acre.



SPAIN, a kingdom of Southwestern Europe. Both geographically and historically it forms a connecting link between Europe and Africa. To the latter continent it was once attached, and now nearly touches it. Of all the countries of Europe, Spain has most persistently preserved its local differences of race and language; of all European countries it presents the most striking contrasts and the greatest diversity of land and people.

Parched, treeless plains are broken by bleak, rocky uplands and ragged sierras. There are luxuriant fields and gardens crossed by winding streams, and, again, barren regions of perpetual snow. Fiery summer heat alternates with biting winter cold.

The people of the several sections are as unlike as the land. Spain, once the most powerful nation of Europe, abounds in relics of its glorious past—a past made resplendent by mighty conquests, vast wealth and brilliant achievement. It has not kept pace with material progress, but is to-day one of the most fascinating countries of the continent—a land of beauty and romance, of quaint tradition, of picturesque customs and manners.

Location and General Features. Spain occupies about six-sevenths of the Iberian peninsula, and has an area of 190,050 square miles. With the Canary and Balearic islands and the possessions on the north and west coast of Africa, it has an area of 194,783 square miles. Its southern and eastern shores are washed by the Mediterranean Sea, its northern coasts by the Bay of Biscay. In the northwest and southwest it meets the At-

lantic, but along most of its western boundary Portugal intervenes to separate it from the sea. France forms less than half of its northern boundary.

The Land and Waterways. The predominating feature of Spain is a great interior plateau, which occupies about three-fourths of the peninsula. This plateau has an elevation varying from 1,000 to 3,000 feet, and is for the most part treeless. It is crossed by numerous mountain ridges, called *sierras*, the most important of which are the Sierra de Guadarrama and the Sierra de Gredos. At its northern limits rise the Cantabrian Mountains, and at its southern boundary are the Sierra Morena. The loftiest mountains wholly within the country are the Sierra Nevada, in the south, the loftiest peak of which is Mulhacén (11,664 feet), the highest point in Europe outside of the Alps and Caucasus. In the Pyrenees, which form a mighty barrier in the north, the highest summit in Spanish territory is Picó de Aneto (11,160 feet). The elevated land reaches to the sea in many places along the southeastern and eastern shore, terminating in cliffs. Alternating with these are great curving beaches. The northwestern shores are deeply indented, while in the southwest the coast is mostly marshes and sand dunes.

The rivers of Spain are of comparatively little economic value. Few are navigable, and all are too far below the general elevation to be useful for irrigation. All the long rivers except one discharge into the Atlantic. The Douro and Tagus flow west across Portugal. The Guadiana, which forms part of the Portuguese boundary, and the Guadalquivir, the deepest stream in Spain, which crosses the great Andalusian plain, both enter the sea on the southwest. The Ebro, which crosses the great plain of Aragon, draining the northeastern section, flows into the Mediterranean. There are no lakes of importance; the largest is Albufera, near Valencia.

Climate. The widest range of temperate climate prevails. There is not only great variation between seasons, particularly in the tablelands, but also extreme changes between the temperature of the days and nights. In the central parts the rivers freeze in winter, while in summer the temperature often rises to 107 degrees. In the hot season the rivers, owing to insufficient rainfall, run low or become dry, and the ground becomes so

parched that whole communities sometimes have to move. Southern Spain is delightful in winter, when rainfall and temperature combine to produce a subtropical vegetation. In summer this region is visited by the *solano*, a hot south wind which often blows for two weeks without ceasing. The northwestern provinces, on the Atlantic, have a moist and equable climate.

People. The Spanish are a bright and vivacious people, most of them dark-skinned and short of stature. They have been called idle, impractical dreamers, accused of vanity and love of show; but, though they shun the slavery of constant labor, they are nevertheless energetic and ambitious. Dreamers they may be, with vivid imaginations for magnificent projects they cannot execute. They esteem themselves highly, but are quick to see merit in others and defects in themselves. The love of pomp and splendor is but a natural heritage of a people with so splendid a past. The dominant characteristics of the typical Spaniard are independence and personal dignity. Under ordinary circumstances he is courteous, affable and witty, with a freshness of speech delightful to foreigners. He is nearly always violent in his loves and in his hatred.

The Spanish people are of a strongly individual character. They have preserved through the centuries the strain of the Iberians, the original inhabitants of the peninsula, only slightly modified by Roman, Teutonic and Berber invasions. The population is smaller than that of any other country of equal opportunity for growth. According to the latest census (1916) it is 20,355,983. A large percentage lives under rural conditions. Madrid, the capital, and Barcelona are the largest towns, each with a population of half a million. Valencia, Seville, Malaga, Murcia, Saragossa, Cartagena and Bilbao are important centers, each with a population of more than 100,000.

Education and Religion. Education in Spain has not kept pace with the general trend of educational advancement. However, since 1901, when it was found that sixty-six per cent of the people were illiterate, far-reaching reforms have been in progress. The law of compulsory attendance has been enforced, more primary schools have been opened, more teachers engaged and at better salaries. The secondary schools, of which there are about sixty, prepare for the univer-

sities; the largest is in Madrid. The government also maintains commercial and technical schools and inspects regularly schools under private ownership.

The national church is the Roman Catholic. All the clergy, religious buildings and institutions are supported by the government. The numerous religious Orders, through their schools and charitable institutions, exercise a powerful influence on the life of the people. Among the small percentage of the people who do not adhere to the Catholic faith, there are 30,000 Protestants, 7,000 Jews, and 4,000 Rationalists.

Language and Literature. Spanish is one of the Romance languages, being derived directly from ancient Latin. Three dialects are spoken—the Galician, in the northern provinces, the Catalan in the south and southeast, and the Castilian in the central part of the country. The last is the language of the court and of the Spanish-American republics.

Spanish literature began, like the literature of most other countries, in songs descriptive of the great deeds of heroes. The earliest of these songs which is extant is one on the *Cid* (see *CID, THE*), the manuscript of which dates from the fourteenth century. Fiction writing began in the fourteenth century, and from that century or the next dates the *Amadis of Gaul*, the most famous of medieval romances. The Golden Age of literature in Spain began in the sixteenth century, and lasted until the second half of the seventeenth. Of the scores of famous men who wrote during this period, the greatest were the poets Calderon de la Barca and Lope de Vega, and the novelist Cervantes (see *CERVANTES SAAVEDRA, MIGUEL DE*). Literature declined in Spain during the late seventeenth century, and the eighteenth century produced few writers of note. The imitation of French literature, which grew up in the latter half of the eighteenth century, had in some ways beneficial effects, as in the drama particularly there were productions of worth. The romantic movement which swept over Europe in the early nineteenth century affected Spain with the other countries, and poets, as well as prose writers, showed its influence. Of the last half of the nineteenth century the most notable literary form in Spain was the novel. A novelist of present-day fame is Vicente Blaso Ibanez, whose *Four Horseman of the Apocalypse*, a story of the World War, was a "best-seller" in America in 1919.

Art. See PAINTING.

Mineral Resources. Spain is one of the richest countries of Europe in mineral resources. It produces more lead, copper and quicksilver than any other country on the continent. Other minerals that are abundant are iron, salt, silver and coal, and there are valuable deposits of zinc, manganese, sulphur and phosphorus. Platinum was discovered there in 1915. Before the discovery of mercury in California, Spain had the most productive mercury mines in the world. These and salt mines are the only mines owned and operated by the government. Most of the others are worked by foreign companies, but many are as yet undeveloped. The yearly output amounts approximately to \$75,000,000.

Agriculture. About ninety per cent of the land is productive, but quite half of it is uncultivated, and in most sections farming methods and implements are most primitive. This condition is due largely to the system of land tenure, and partly to the inadequate means of communication. For centuries the land has been held in large estates owned by the nobility and rented to tenants at high rates. Within recent years the government has attempted, through an agricultural commission, through schools of farming and through irrigation, to promote the industry. Some of the large estates have been divided and sold to farmers on reasonable terms.

There are several distinct agricultural districts, which, owing to surface and climatic differences, have widely diversified interests. In the southern provinces, bordering on the Mediterranean, known as the gardens, every part of available ground is brought under tillage. The land is terraced, fertilized and irrigated by canals supplied from reservoirs. Large crops of oranges, lemons, grapes and other fruits are produced. In the extreme south almonds, figs, date palms, bananas and sugar cane are cultivated. In the interior the intense heat and dryness interfere with the successful pursuit of agriculture, and there are large areas of waste land. The northwestern provinces have diversified farming interests, and stock-raising is profitable. Here the fruits common to Central Europe are cultivated in abundance, and wheat, barley, oats, rye and other cereals are grown. One of the chief crops of Spain is the vine, grown in every province. Not only are large quantities of grapes and raisins exported, but

millions of gallons of wine. Hundreds of acres are planted in olives. Spain is the home of the Merino sheep, large numbers of which are raised.

Although the fisheries are important, they fail to supply the home demand, and the importation of fish is large. The catch consists chiefly of sardines, tunny and cod.

Manufactures. The manufactures are limited and are not sufficient to supply the home demand. Catalonia, in the northeastern part of Spain, is the leading manufacturing province. Following this, in the order of importance, are the districts of Galicia, Asturias and Vizcaya, which have an abundance of water power. A few of the large towns in the interior, including Madrid, Seville and Toledo, also have some manufactures. Barcelona is the chief manufacturing city of the country, and the leading industries include the manufacture of textiles, metal, paper and leather, and lace making. The provinces Valencia, Murcia and Andalusia manufacture some silk and woollen goods. The manufacture of tobacco is of importance in Madrid, Seville, Valencia and other towns. There are also manufactures of gold and silverware, jewelry, sugar, olive oil, cork, glass and porcelain.

Government. By the constitution of 1876 Spain is declared a constitutional monarchy. The executive power is vested in the king and the legislative power in the national legislature (known as the Cortes) and the king. The Cortes consists of a Senate and Chamber of Deputies. Of the 360 Senators, eighty sit by right of royal or noble birth or official position, 100 are appointed by the crown and 180 are elected by a limited suffrage for a term of five years. The terms of one-half of the elective class expire every five years; but on dissolution of the Cortes by the king the terms of all expire. The king may dissolve the Cortes at any time, but must assemble another within three months. The Deputies, of whom there are 406,—one for every 50,000 people,—are also elected for five years. Senators and Deputies have equal authority. Since 1907 voting has been compulsory.

Each of the forty-nine provinces has its own parliament, and each commune its elective assembly; neither the king nor the Cortes has the right to interfere in local government in the provinces except where the general interest is concerned.

Army and Navy. Military service is compulsory. The total liability for service is eighteen years. In time of peace the field army numbers about 130,000, officers and men; in time of war it may be increased to 300,000. From the army are recruited the Civil Guards and the Carabineros, the former a constabulary, the latter a military police who act as customs guard on the frontier. After the outbreak of the World War an army aeronautic department was created.

The navy is not strong as compared with other European navies. Since the Spanish-American War it has been in process of rebuilding. The program approved in February, 1915, provided for cruisers, gunboats, destroyers, submarines, mines and new repair docks. In 1917 the number of sailors was 10,051; marines, 4,000.

Colonies. All of Spain's colonial possessions are in Africa or adjacent to its shores. They include Rio de Oro and Adrar, on the Sahara Coast; the Muni River settlements, on the banks of the Muni and Camp rivers and the Gulf of Guinea, also called Spanish Guinea; and the islands of Fernando Po, Annobon, Corisco and the Elobey Islands in the Gulf of Guinea. These possessions are a liability rather than an asset, costing Spain \$400,000 a year. Politically the Canary and Balearic Islands are regarded as an integral part of Spain. Rio de Oro and Adrar are administered by the governor of the Canary Islands; the other possessions are governed from Santa Isabel, capital of Fernando Po.

History. When the Phoenicians landed in Spain and began colonization, probably at the end of the twelfth century B. C., they found the country inhabited by a race of mingled Celtic and Iberian stock, to whom the name Celtiberians has been given. After the Phoenicians came the Greeks, but the history of Spain did not really begin until the third century B. C., when the Carthaginians conquered almost the entire peninsula. Hamilcar Barca, Hasdrubal and Hannibal were the three great generals who established the empire of Carthage in Spain. As a result of the Punic wars, the Carthaginians were driven from Spain and the Romans came into possession of the territory. Not until 19 B. C., however, was the entire peninsula brought into subjection to Rome. Three provinces were formed from the conquered territory, and these were prosperous and powerful under the Roman rule.

In the early part of the fifth century, A. D., the Visigoths entered Spain and there established a kingdom. For three centuries the Gothic rule continued, but in 711 the Arabs overthrew the Visigothic king and made the greater part of Spain a dependency of the caliph. Gradually, in the mountainous districts of the Pyrenees, independent Christian kingdoms were established, and these small states were constantly at war among themselves for supremacy. In the eleventh century, Aragon and Castile emerged as the most powerful, and little by little they absorbed the other states. Fortunately for these two new powers, the Omniad dynasty of the Moors, which had been in power for almost three centuries, became extinct in the eleventh century, and the subsequent division of the Mohammedan territory into small independent states favored the expansion of the Christian states. By the early part of the thirteenth century the Moorish dominion in Spain had been almost entirely overthrown by the united efforts of Castile, Navarre and Aragon, and even the Kingdom of Granada, the only Moorish kingdom which remained, was forced to admit the supremacy of Castile in all matters affecting the two provinces.

By the marriage of Isabella of Castile to Ferdinand of Aragon, these two countries were united (1479), and they were thus enabled to undertake the conquest of what remained of Moorish power in Spain. After a ten years' war, Ferdinand and Isabella in 1492 entered Granada, the Moorish capital, and thus became the sovereigns of all Spain, with the exception of Navarre. Twenty years later Navarre, except the part north of the Pyrenees, was also taken by Ferdinand, and all Spain became united under one ruler.

The next hundred years was the period of Spain's greatest glory. The discovery of America opened up new opportunities for the growth of the kingdom. The grandson of Ferdinand, Charles V, gained to the country the Netherlands and Milan. In time Mexico, Peru, Central America, Venezuela, Cuba, Chile, Jamaica and Santo Domingo were conquered, and these poured into the royal treasury a stream of wealth. Parts of Africa were also conquered, and the Spice Islands, Malacca and the Philippines were acquired. The European territory added included Portugal, Naples, Sicily, Sardinia, the Canary and Balearic islands. Spain was then the most powerful nation of Europe.

The tyranny and bigotry of Philip II, son of Charles V, and of his successors, Philip III and Philip IV, were among the immediate causes of the decline of Spain. Religious persecution, civil wars and insurrections seriously weakened the kingdom. The loss of The Netherlands was a great blow to the country, and the wars with England worked great damage to the Spanish navy. With Charles II (1665-1700), the Hapsburg dynasty became extinct in its male line, and only by the disastrous War of the Spanish Succession were the claims to the throne settled. At the close of the struggle Philip of Anjou was recognized as king and ruled as Philip V, the first of the Bourbon line in Spain. The war had hastened the decline of Spain, by depriving it of many colonial possessions, including Parma, Naples, Sardinia, Milan, Sicily, Gibraltar and Minorca.

Ferdinand VI (1746-1759) and Charles III (1759-1788) both introduced reforms into the government and strengthened the state somewhat, but Charles IV (1788-1808) was not as strong a ruler as his two predecessors, and all that had been gained under them was lost. War with France brought heavy losses and conflict later with England as an ally of France ended in defeat at Trafalgar (1805). In 1808 affairs had come to such a state that Charles felt that safety for himself and for Spain lay only in his abdication, and he therefore gave up the throne to his son Ferdinand. Napoleon compelled Charles and Ferdinand to renounce all claims to the Spanish crown, which he conferred on his brother, Joseph Bonaparte. The Spanish people refused to recognize the Bonapartes as their rulers and declared for Ferdinand, and the active resistance which followed on their declaration was the first step toward Napoleon's overthrow. In 1814 Ferdinand again entered Madrid as king, and a reactionary policy was immediately adopted by him. From this time until 1868 the Bourbon dynasty reigned uninterruptedly, and liberals and absolutists in turn held the chief power in the State. In 1868 a revolt arose, headed by Prim, and the queen, Isabella, was driven from the country.

The attempt of the Spanish to find for themselves a ruler, led indirectly to the Franco-German War. From December, 1870, to early in 1873, Amadeus, son of Victor Emmanuel of Italy, reigned as king at Madrid, and after his abdication a republic

was organized. The republic proved unpopular, and in 1875 the monarchy was reëstablished, with Alfonso XII, son of Isabella, as king. Alfonso reigned for ten years, and his posthumous son, Alfonso XIII, succeeded him, with Christina, his mother, as regent. A rebellion in Cuba was met with the greatest severity, and complications ensued which led, in 1898, to war with the United States, the result of which was the loss to Spain of Cuba, Porto Rico and the Philippine Islands. Since that conflict efforts have been made to rehabilitate the country. During the World War Spain succeeded in remaining neutral, but was torn by internal troubles, and during the mining and railroad strikes of 1916 the country was under martial law.

Related Articles. Consult the following titles for additional information:

CITIES		
Barcelona	Cordoba	Murcia
Bilbao	Granada	Saragossa
Cadiz	Madrid	Seville
Cartagena	Malaga	Valencia
HISTORY		
Alfonso XIII	Isabella of Castile	
Alhambra	Maria Christina	
Alva, Duke of	Moors	
Aragon	Napoleon	
Armada	Navarre	
Castile	Peninsular War	
Charles V (Holy	Philip II and V	
Roman Emperor)	Spanish-American War	
Ferdinand V	Succession Wars	
Gonsalvo de Cordova	Torquemada, Thomas	
Granada	de	
Hamilcar Barca	United States, subhead	
Hannibal	History	
Iberia		
ISLANDS		
Canary	Balearic	
MOUNTAINS		
Pyrenees	Sierra Nevada	
RIVERS		
Douro	Guadiana	
Guadalquivir		

SPANIEL, *span'ye'l*, the name given to several breeds of dogs which include field and water hunting dogs, and several smaller breeds of the fancy, or "toy," variety. They are characterized by a rather broad muzzle, remarkably long, full ears, plentiful and beautifully-waved hair. The prevailing colors of most breeds are liver and white, although some are red and white, black and white, or deep brown or black on the face and breast, with a tan spot over each eye.

Kinds of Spaniels. The Irish breeds constitute the best known water spaniels. Among the most popular field hunting spaniels are the *Clumber*, *Sussex*, *Norfolk* and *Cocker*. The *King Charles*, a small variety, common as a lapdog, is usually black and tan or brown and has a large head and a small, well-coated body. In addition to the King

Charles, the *Blenheim* and the *Japanese* are well-known lap spaniels. The *Maltese* is also a small species of spaniel. The *water spaniels*, large and small, differ from the common spaniel only in the roughness of their coats. They are fond of the water and make excellent retrievers. Their intelligence, affection and obedience, combined with their beauty, make spaniels highly prized as house dogs. See DOG.

SPANISH-AMERICAN WAR, the war between Spain and the United States in 1898, was of short duration, but important in its effect upon the history of the world.

Cause of the War. The war's fundamental cause was the inability or unwillingness of Spain to govern Cuba according to principles of freedom and justice. It was a result of nearly a half-century of disagreement and negotiation, during which the United States often had proposed to purchase the island, in order to remove the menace to American industries and peace, while the island itself had been in almost constant turmoil from rebellion and accompanying oppression. The last insurrection began in 1895, and despite the most determined efforts of Spain, through severe measures undertaken by its governors-general, Campos, Weyler and Blanco, the Cubans had succeeded in establishing a semblance of an independent government and had maintained more or less successful warfare against the Spanish army.

Declaration of War. The interest of the United States government became more and more centered upon Cuban affairs, and finally the United States battleship *Maine* was sent to Havana to protect American interests. On the night of February 15, 1898, the vessel was destroyed by an explosion. Though responsibility could not be placed upon Spanish officials, the American people were convinced that it was the result of a deliberate plot, and public sentiment forced Congress soon to declare war (April 25). Meanwhile, it had declared that "the people of Cuba are and of right ought to be free and independent," demanded that Spain relinquish her authority in the island, and authorized President McKinley to use the army and navy of the United States to accomplish that end.

Naval Engagements; Campaigns. The first gun of the war was fired April 23 by the *Nashville*, in the capture of a Spanish merchantman. Commodore Sampson, with

the North Atlantic naval squadron, began a blockade of Havana and the north coast, while volunteer troops to the number of 200,000 were soon recruited, drilled and equipped at several camps.

The first important engagement was at Manila Bay, where Commodore George Dewey, in command of the Asiatic squadron, completely annihilated the Spanish fleet. Troops were immediately sent to the Philippines under General Merritt, and an attack by the land and naval forces led to the fall of Manila on August 13. Meantime, a Spanish fleet under Admiral Cervera reached Cuban waters and took a position in the harbor of Santiago, on the southern coast of Cuba, where it was blockaded by an American fleet under Sampson and Schley. It was during this blockade that Lieutenant Hobson and a crew of volunteers attempted to bottle the entrance to the harbor by sinking the collier *Merrimac*.

Land Campaigns. In June, General Shafter, with a force of 17,000 men, landed at a point a little east of Santiago and invested the town. The enemy gradually retired within its fortifications in Santiago, offering the only important resistance at the hills of San Juan and El Caney, which were finally gained by the Americans under Major-General Shafter on July 2. On the following day Cervera, under orders from his government, attempted to break the blockade; but after a long running fight his whole squadron was beached or destroyed, and he, together with 1,700 men, was captured. The siege of the city was continued until July 15, when General Toral surrendered the whole District of Santiago.

Terms of Peace. On July 25 General Miles raised the United States flag over Porto Rico, and on the following day Spain made overtures for peace. August 12 a protocol was signed, and in December a final treaty of peace was accepted, by which Spain relinquished all claims to Cuba and surrendered Porto Rico, the Philippines and Guam to the United States, for a consideration of \$20,000,000 and special commercial privileges.

This war focussed attention upon several of its leaders. Commodores Schley and Sampson were each promoted to the rear-admiralty. Theodore Roosevelt, in command of the "Rough Riders," distinguished himself at San Juan, and on his return home was elected governor of New York.

The total expense of the war to the United States was \$165,000,000; 2,910 American soldiers lost their lives, of whom all but 306 died of disease. Because of this fearful death rate from causes other than battle, an investigation of the War Department was instigated, which, however, resulted in a general acquittal of the responsible officials.

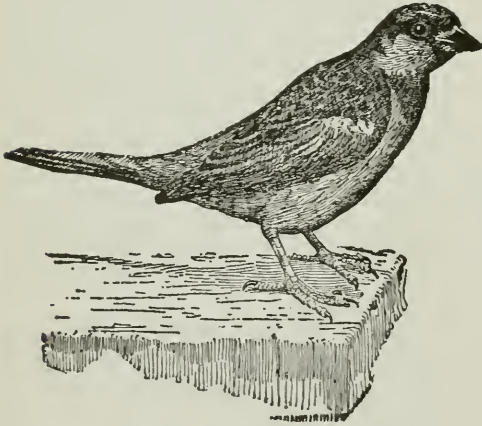
Related Articles. Consult the following titles for additional information:

Cuba	Roosevelt, Theodore
Dewey, George	Rough Riders
El Caney, Battle of	Sampson, William T.
Hobson, Richmond P.	Schley, Winfield S.
McKinley, William	United States
Manila Bay, Battle of	subhead History
Philippine Islands	Weyler, Nikolau V.
Porto Rico	Wood, Leonard

SPANISH INFLUENZA. See INFLUENZA.

SPANISH SUCCESSION, *suk sesh'un*, WAR OF THE. See SUCCESSION WARS.

SPARROW, the name of a large group of finches, which have, in general, a brown and gray plumage. The birds feed and nest on or near the ground, and are among the least



ENGLISH SPARROW

timid of wild birds. They chirp noisily, but comparatively few are songsters. The common *English house sparrow*, which is about six inches long, was brought to the United States and Canada about the year 1869 and has increased astonishingly in numbers, until now it is probably more numerous than any other wild bird. One pair will raise several families of four or five each year. These sparrows live chiefly in and about cities and towns.

It was once thought that sparrows were aids to the farmer, but it is now known that they eat few insects, but live chiefly upon grains and the refuse they gather near houses. They are notorious fighters among themselves,

and usually drive away the more desirable birds. Of the American species the most common is the *chipping sparrow*, a small grayish bird marked with a chestnut crown. The *field sparrow*, an eastern resident, and the *tree sparrow*, a winter visitor only, are similar species. The *sea-side* and the *sharp-tailed sparrows* inhabit the coast marshes.

There are in America several distinct species of musical sparrows. The *song sparrow*, a six-inch bird streaked on the breast with black or brown, has a remarkably clear, sweet refrain. The *vesper sparrow*, similarly marked, has a habit of singing in the late afternoon. One of the well-known sparrow songsters of the West is the *black-throated dickcissel*, while the large *fox sparrows* and *Harris sparrows* of the same regions are known to gather in flocks and sing in chorus. A beautiful little bird is the *white-throated sparrow* most familiar along the Canadian boundary, whose clear, cheery note is heard in the spring and about the summer nesting places.

SPARROW HAWK, a very small hawk, about ten inches long, which ranges from Northern Canada to Mexico. It is reddish-brown and black on the shoulders, and back and has grayish-blue wings. The nests are made in holes in trees. The eggs, numbering from five to seven, are cream-white marked with brown. The birds feed on insects, small rodents, reptiles and other enemies to the farmer, and thus render a distinct service to agriculture.

SPARTA, *spahr'ta*, or **LACEDAEMON,** *las e de'mon*, a celebrated city of ancient Greece, the capital of Laconia and the chief city of the Peloponnesus. It was a scattered city consisting of five separate sections. Unlike Athens, it was plainly built and had few notable buildings; consequently it left no imposing ruins.

The Spartans were a stern and rugged warrior race, despising danger and esteeming military glory the highest of honors. They were temperate in eating and drinking, and their food was of the plainest sort. By law they were debarred from trade and agriculture, and their chief occupation was military drill and physical exercise. The form of government was aristocratic, and the executive power was vested in two kings and five ephors. The Spartan child was trained to endure any hardships, to be self-controlled and obedient to authority. From the

age of seven to twenty he lived in a public institution and took his meals at the public table. From twenty to thirty he lived under arms in barracks, and although at thirty he was required by the law to marry, he still ate at the public table.

According to tradition, the Spartan state was founded by Lacedaemon, son of Zeus. The most celebrated of its legendary kings was Menelaus. It is believed the Spartans were the descendants of the Dorians, who invaded the Peloponnesus not later than 1000 B. C. Such of the former inhabitants of the state as did not emigrate were allowed to keep the poorest lands about the city and to work as tradesmen or mechanics, but they were given no part in the government. About 900 B. C., Lyncurgus gave the country a code of laws under which it prospered.

About this time the Spartans entered on a period of conquest. They extended their sway over all the territory of Laconia, a part of the inhabitants of which they reduced to the condition of slaves. They also waged war with the Mycenaean, the Arcadians and the Argives, against whom they were so successful that before the close of the sixth century B. C. they were recognized as the leading people in Greece. Early in the following century the Persian war began, during which a rivalry grew up between Athens and Sparta. This rivalry led to the Peloponnesian War, in which Athens was humiliated, and the old ascendancy of Sparta was reestablished. Soon after this the Spartans became involved in a war with Persia by joining Cyrus the Younger in his rebellion against his brother Artaxerxes, and Athens, Thebes, Corinth and some of the Peloponnesian states seized the opportunity to declare war against Sparta. The final outcome of this struggle was the defeat of Sparta at Leuctra in 371 B. C.

During the following century Sparta steadily declined. Although determined attempts were made to restore its former greatness, these failed because there were less than a thousand inhabitants of true Spartan descent, and the majority of these were in a state of beggary. When Philip of Macedon entered Greece, Sparta struggled vigorously against him, but Macedonia was victorious in the end. With the rest of Greece, Sparta passed under the dominion of the Romans in 146 B. C. The old constitution of Lyncurgus was reestablished under Roman rule, and the city pros-

pered until the fifth century, when it was sacked by the Goths.

Related Articles. Consult the following titles for additional information:

Athens	Helots	Peloponnesus
Dorians	Lyncurgus	Philip II
Greece	Menelaus	Thermopylae

SPAR'TACANS, the name applied to a group of German radicals, who under the leadership of Dr. Karl Liebknecht and Rosa Luxemburg opposed the Social Democrats on the reorganization of the German government after the abdication of the Kaiser, Wilhelm II, in November, 1918. The Spartacans are extreme Socialists, and have for their purpose the development of a dictatorship of the common people. Dr. Liebknecht had issued a number of pamphlets opposing the war, under the pen name of *Spartacus*, and from this incident the party took its name.

The Spartacans adopted the methods of the Bolsheviki in Russia and attempted to inaugurate a reign of terror by starting a counter-revolution. They were, however, soon suppressed. Rosa Luxemburg was killed by a mob and Liebknecht was shot while attempting to escape from a guard that held him under arrest. While the loss of the leaders, together with the active measures taken by the government to suppress the Spartacans, stopped the counter-revolution, the party continued its propaganda. See GERMANY; LIEBKNECHT, KARL.

SPAR'TACUS, a Thracian gladiator, the instigator and leader of a revolt of the slaves in Italy, between 73 and 71 B. C. He had been compelled, like other barbarians, to serve in the Roman army, but he had deserted and become the head of a band of robbers. At length he was taken prisoner and placed in a gladiatorial school at Capua, with two hundred other slaves. They formed a conspiracy, effected their escape and were joined by the disaffected slaves and peasantry of the neighborhood, so that in a few months Spartacus found himself at the head of over sixty thousand men. Two consuls were sent with armies against him, but Spartacus defeated them in succession and led his forces toward Rome. In this crisis Crassus was placed at the head of the army and managed to hem in the revolted slaves near Rhegium. Spartacus broke through the enemy by night and retreated, but later he had to encounter the army of Crassus. His soldiers were overcome, and Spartacus himself fell fighting.

SPARTANBURG, S. C., the county seat of Spartanburg County, ninety-three miles northwest of Columbia, on the Charleston & Western Carolina, the Carolina, Clinchfield & Ohio of South Carolina, the Southern, and the Piedmont & Northern railroads. The city is on an elevation of over 800 feet. It is in a rich cotton-growing region, containing, also, deposits of limestone, granite, gold and iron. There are thirty-eight cotton mills with more than 800,000 spindles, ironworks, lumber mills, broom factories and soap works. Converse College and Wofford College are located here, also a state institution for the deaf, dumb and blind. The city has the commission form of government. Population, 1910, 17,517; in 1917, 21,985 (Federal estimate).

SPASM, *spaz'm*, an ailment of which the chief feature is jerking of the muscles. Spasm is a symptom of disease, not a specific disease. It occurs in epilepsy, in the final stages of Bright's disease, frequently in poisoning cases, and occasionally in attacks of indigestion. Children suffering from intestinal trouble sometimes have convulsions more terrifying than dangerous. The remedy for attacks of spasm depends upon the cause, and must be determined by a physician.

SPAVIN, a disease of horses, which affects the hock joint, the joint in the hind leg between the knee and the fetlock. Spavin may occur in two forms. The first, which is called *bog*, or *blood spavin*, arises from an injury and is accompanied by swelling and inflammation. In the other form, known as *bone spavin*, there is an injury which causes a bony substance to be deposited about the joint, in some cases causing permanent stiffness. A bone spavin grows very slowly, and it may not be noticed until the horse becomes lame. No cure has been found for it. The treatment for bog spavin consists in hot applications and blistering. When these fail, burning with a hot iron may be resorted to, but this should be done by a skilful veterinarian.

SPAWN, the eggs of fishes, frogs and reptiles. The number of eggs produced by fishes varies greatly in different species; for instance, in the spawn of a single codfish, as many as 3,500,000 eggs have been found. Fish eggs are an important article of food for sea animals, and hence millions are necessary to save a species from extinction.

As a measure of safety sea fish often ascend rivers in the spawning season; and some fresh-water fishes spawn in the ocean.

SPEAKER, *speek'er*, the title given to the presiding officer of a legislative body. It applies to that official in the English House of Commons, in the House of Representatives in the United States and in the like body in each state legislature.

Until 1910 the Speaker of the United States House of Representatives was assumed to be the second most powerful man in the government of the nation, next to the President. This was due to his power to appoint committees of the House; it was possible by the use of this authority practically to control legislation. In the year named, however, the Speaker was deprived of this arbitrary power.

The Speaker of the House is chosen from among the membership of that body, for a term of two years, and he has a vote on all questions. By calling another member to his post he may descend to the floor and address the House on any subject. He receives an annual salary of \$12,000, equal to that of the Vice-President, who is presiding officer of the Senate.

In the state legislature the Speaker has powers and duties very similar to those of the Speaker of the United States House of Representatives.

In the English House of Commons this official is strictly non-partisan, and the office may be held permanently by the same person through several opposing administrations. He cannot take part in debate, neither can he vote on any question except in case of a tie. See CONGRESS OF THE UNITED STATES; REPRESENTATIVES, HOUSE OF.

SPEARMINT, *speer'mint*, a species of mint native to temperate regions of most parts of the world. Ninety per cent of the peppermint of the United States is produced in Saint Joseph County, Mich., the world's most important center of spearmint distillation. In this vicinity almost every evening the wind wafts breezes heavily laden with mint odors.

Spearmint yields an oil utilized in the preparation of perfumes and medicine and as flavoring in chewing gum, julep, candies, soups, sauces, etc. The smooth, erect stems of the plant grow to two feet in height and bear at the top whorls of pale purple or white flowers. See MINT.

SPECIE, *spé'she*, **PAYMENTS**, RESUMPTION OF, in American history, specifically, the steps taken by the United States between 1875 and 1879 for gradual redemption of United States notes, of which there were at that time \$382,000,000 out-standing, as a result of the issues of paper money during the Civil War. It had been found necessary in 1861 to suspend the redemption of these notes in metallic money, by reason of the extraordinary demand for gold caused by the war.

As the volume of paper money increased, its value naturally decreased, causing not only a rise of prices, but a general uncertainty in financial and commercial circles. In order to improve the situation, an act was passed in 1866 providing for the gradual retirement of greenbacks and the payment of them in specie, but this was not satisfactory. Another act was passed in 1875, providing for complete resumption of all notes presented on January 1, 1879, and for the gradual accumulation of gold in the treasury by means of the sale of bonds, for the purpose of redeeming these notes. As the supply of gold increased, the value of greenbacks or government notes proportionately rose, and when the government offered to redeem its notes in gold, few were presented.

SPECIES, *spé'shez*, a distinct kind of animals or plants. Any group of individuals having common characteristics and designated by a common name, although they may differ among themselves in minor details of form or color, is called a species. Such individuals reproduce their kind by indefinite interbreeding. A group of species with points in common is called a genus. See CLASSIFICATION.

SPECIFIC GRAVITY. See GRAVITY, SPECIFIC.

SPECTACLES, an optical device designed to aid the eyesight, the invention of Roger Bacon, an English scientist of the thirteenth century. The first spectacles were very crude, and it was not until the eighteenth century that they began to be made according to the principles of refraction of light. Spectacles consist of a pair of lenses made of clear rock crystal, ground according to a formula to meet the needs of the person for whom they are intended. Long-sighted persons require convex lenses; those who are short-sighted need lenses which are concave. When the eyes have difficulty in distinguishing objects both near and far, divided (bi-focal)

spectacles are worn. In these each lens consists of two semi-circles of glass, differently ground, fitted neatly together one above the other in the frame, or of a single piece of glass with the upper and the lower half ground to focus differently. The latter is very much more expensive. In cases of astigmatism, a structural defect of the eye, the lens used is the segment of a cylinder.

Spectacles can be made with such skill and in such variety that almost any defect in vision arising from irregularity in the shape of the eye can be corrected by them. One should never select spectacles without consulting a skilled oculist, since the eyes are seldom alike, and a lens that is suited to one eye is not suited to the other. Unless spectacles are adjusted to the eyes, they are liable to be injurious rather than beneficial.

The frame of spectacles is made of tortoise shell or of metal, usually gold or steel. It consists usually of a rim enclosing the glass, joined by a bridge which rests upon the nose, and side bars and bows, which fit over the ears. Glasses which are held by clips to the nose are rapidly supplanting those held by bows.

SPECTROSCOPE, *spek'tro skope*, an instrument for studying the spectra of bodies (see LIGHT, subhead *Spectrum*). The ordinary spectroscope has a central prism enclosed in a frame, shaped like an alarm-clock case and laid face upward on a standard. From the sides of this frame extend, horizontally, three large tubes, equidistant from one another. One of these tubes, called the *collimator*, has, at the end near the prism, a double-convex lens, and at the other end, at the focus of the lens, a small slit, formed by two pieces of adjustable metal which regulate the width of the slit and the amount of light admitted. The light entering the slit strikes the prism in parallel rays. One of the tubes contains a graduated scale, by means of which the spectrum is thrown on a screen, and the other is a telescope, by means of which the phenomena are observed.

The spectroscope is used for the purpose of determining the composition of the heavenly bodies, such as the sun and stars, and the composition of substances when adulteration is suspected. It is much used in astronomy. By means of it astronomers may determine distances in space and the directions and velocities of remote bodies. It has made possible some of the greatest of as-

tronomical discoveries. See SPECTRUM ANALYSIS.

SPECTRUM. See LIGHT.

SPECTRUM, *spek'trum*, **ANALYSIS.** By passing a beam of sunlight through a glass prism in a dark room an image containing all the colors of the rainbow is obtained. This image is called the *solar spectrum*, and is formed because the prism separates the beam of white light into the colors which unite to form it. Experiments with other substances show that they also produce spectra when burned in the spectroscope (which see), and *spectrum analysis* is the process by which the composition of substances is ascertained by the spectroscope. Burning bodies produce three kinds of spectra, known as the continuous spectrum, the bright-lined spectrum and the dark-lined, or absorption spectrum. For instance a *continuous* spectrum is formed by a glowing or burning body near the instrument or by the sun when its rays are analyzed by a single prism. If a candle or gas light is burned near a prism, it forms a continuous spectrum. A *bright-lined* spectrum is formed when gases which are not under great pressure are burned. The lines thus formed have a definite position in the spectrum and never change in the same substance. The *dark-lined* spectrum is formed by the absorption of light as it passes through the vapor of some substance between the burning body and the spectroscope. Experiment has shown that the vapor of any substance absorbs the rays of light which that substance produces in the spectrum when it is burned. These dark lines are known as *Fraunhofer* lines, from the name of their discoverer, and a number of them appear in the spectrum of the sun. Since these occupy a definite position on the screen, they are designated by the letters of the alphabet as *a, b, c*.

The process of spectrum analysis is as follows: The dark lines in the solar spectrum are produced by its light passing through the vapor of certain substances. Since, in the spectrum of iron, bright lines cover certain dark lines in the solar spectrum, therefore we infer that the atmosphere of the sun contains the vapor of iron. The presence of other substances in the sun has been discovered in a similar manner. In testing the composition of any substance by means of the spectroscope, a small quantity of the substance is burned and its spectrum is noted. In case the substance contains impurities, the

lines which these impurities form will also appear on the screen, and their presence is thus noted. The great value of the spectroscope for ascertaining the purity of substances is in its ability to detect minute quantities. It is estimated that as small a quantity as $\frac{1}{2500000}$ of a grain of lithium can thus be detected.

SPEECH, in the broadest sense, is the art of using language to convey thought. In a more restricted sense speech may be designated as the act of expressing ideas by means of vocal sound. According to the latter definition, "Polly wants a cracker," which is merely a repetition of a succession of orderly sounds without understanding of their meaning, could not be called speech; neither could the utterances of delirious persons and maniacs, and yet these latter are more than *voice*, which is merely the act of producing any sound by means of the vocal organs. Speech is to be distinguished from *language*, which is merely a system or code used in common by a group of individuals for intercommunication.

SPEEDOMETER, a device for recording the speed at which a vehicle is moving and also the distance traveled. It is also known as a *cyclometer*. The speedometer is in general use on automobiles, and is frequently attached to bicycles. The speedometer for automobiles consists of a system of clockwork connected with the fore wheel of the automobile, so adjusted that one dial records the distance traveled, and the other indicates the speed in miles per hour. The device used on bicycles records the distance traveled. It is of simpler construction and is set in motion by a cam on the spoke of the fore wheel.

SPELLING, *spel'ing*. Quite as important as correct articulation of the sounds that form a word and the proper placing of the accent, is accurate spelling of the word. The ability to spell correctly is cultivated largely by means of careful observation in one's reading and by persistent efforts to be exact in spelling words both orally and in writing. Especially is this true of those who use English, since our language is usually lacking in uniformity in the matter of spelling. However, there are several rules for spelling that are so generally appreciable as to be of much value to those who do not readily retain in memory the exact form of words. Among these rules the following are most important:

Rules of Spelling. Words ending in *ie* usually drop the *e* and change *i* to *y* in adding the suffix *ing*; as, lie, lying.

Words ending in *y*, preceded by a consonant, change *y* to *i* when a suffix beginning with a consonant is added; as, bounty, bountiful.

Words ending in *y*, preceded by a vowel, retain the *y* in adding a suffix; as, joy, joyous.

Monosyllables and words accented on the last syllable, ending in a single consonant, preceded by a single vowel, double the final consonant before a suffix beginning with a vowel; as, hit, hitting; begin, beginning.

Words ending in silent *e* drop this final *e* when a suffix beginning with a vowel is added; as, residue, residuum.

Words ending in *e* usually retain this final letter when adding a suffix beginning with a consonant; as, resolute, resoluteness.

When a syllable is added to a word ending in a double consonant, this consonant is usually retained; as, still, stillness.

Nouns regularly form their plurals by adding *s*; as, table, tables.

However, when the singular noun ends with a sound that does not unite with *s*, *es* is added; as, church, churches.

Nouns ending in *y* preceded by a vowel form their plurals by adding *s*; as, monkey, monkeys.

When final *y* is preceded by a consonant, *y* is changed to *i* and *es* is added in forming the plural; as, city, cities.

Some nouns ending in *f* or *fe* change the *f* or *fe* to *v* and add *es* to form the plural; as, shelf, shelves.

Nouns ending in *o*, preceded by a consonant, sometimes form the plural by adding *s* but more frequently by adding *es*; as, solo, solos; motto, mottoes; potato, potatoes.

Root Words and Derivatives. Interesting recitations in the formation of derivatives from root words may prove of much assistance in teaching children to analyze the building up of words when they find difficulty in spelling them. A root word may be chosen and as many derivatives as possible formed from it by adding prefixes and suffixes. The same lesson may prove doubly profitable by defining the root word and showing the changes in significance after the addition of the prefixes or suffixes. The following is offered as a suggestive exercise.

Tract—Draw

- Tract-oror=that which.
- Tract-ionion=act of.
- Tract-ileile=may be.
- Tract-ableable=able to be.

- Abs-tractabs=away from.
- At-tractat=near to.
- Con-tractcon=together.
- De-tractde=away from.
- Ex-tractex=out of.
- Pro-tractpro=out.
- Re-tractre=back.
- Sub-tractsub=from under.
- Attract-iveive=tending to.
- In-tract-ablein=not. .able=able to be.

Explanation. A tractor is an instrument which draws.

Traction is the state of being drawn or the act of drawing, as the traction of a muscle.

Gold is a tractile metal, as it may be drawn out in thin strips.

A tractable person is one easily drawn to a proper course of conduct.

An abstract manner results when the mind is drawn away from surrounding objects.

To attract people we must have power to draw them to us.

To detract from value is to lessen or draw away from it.

An extract from a book is a part which is drawn out of it.

A protracted meeting is one which is drawn out or extended beyond the usual time.

When a statement is retracted it is withdrawn—"taken back."

When a number is drawn from under or taken away from another we subtract it.

That which tends to draw one to it is attractive.

An intractable student is one who is not easily drawn to discipline.

Spelling Reform. It is generally agreed that English spelling is complicated and illogical. Considerable progress has been made in the direction of simplification, though the radical changes proposed by some advocates of spelling reform have not been adopted generally. The radicals, for example, would write *dout* for *doubt*, *hed* for *head*, *nat* for *gnat*, and *fantom* for *phantom*. In the United States many educators have adopted the recommendations of the National Education Association, which uses the following forms:

altho	demagog	program	thorofare
catalog	pedagog	tho	thru
decalog	prolog	thoro	thruout

The general tendency is toward dropping superfluous letters, but it will require a long time to eliminate such letters completely.

SPENCER, HERBERT (1820-1903), distinguished English philosopher. Because of delicate health during childhood and youth, he was educated at home and lived most of the time out of doors. In this way he ac-

quired a dislike for schools, and so completed his education under tutors. During this time he was much interested in making collections of insects and in rearing moths and butterflies and in studying the botany of the locality.



HERBERT SPENCER

At the age of seventeen, Spencer became an engineer on the London & Birmingham Railway and remained at that occupation ten years. After this he was for four years sub-editor of the *Economist*; and it was in the course of this latter period that he made the acquaintance of George Eliot, John Stuart Mill and other celebrated scholars and thinkers and published his *Social Statics*. Spencer conceived the idea of publishing a philosophy whose scope should include all existing knowledge, and upon this he faithfully labored throughout his life and was finally able to see it completed and published.

Spencer was remarkably well fitted by nature for the task which he had set himself. He was a patient observer and had acquired a vast store of facts in all sciences and possessed the power of seeing relations between facts to a remarkable degree—to a much greater degree than Darwin or other specialists. Whatever opposition may in the future be given his “principles,” intelligent men will always look with the greatest respect upon his effort to systematize knowledge and will give to him the credit accorded to no other man who has engaged in a similar labor.

Like Darwin, Spencer was a thorough believer in evolution and did much through his lectures and writings to establish and extend the theory (see *EVOLUTION*). He believed in the unity of all things, and he set forth this belief in so convincing a manner that his popularity grew in spite of the violent opposition which some of his statements caused. His works have been particularly well received in the United States. Among those best known are *First Principles*, *Principles of Biology*, *Principles of Psychology*, *Principles of Sociology*, *Principles of Ethics* and *Education*. Besides these, he wrote

numerous books on various subjects and three volumes of *Essays, Scientific, Political and Speculative*.

SPENCER GULF, an inlet of the Southern Pacific Ocean, on the southern coast of Australia, extending inward two hundred miles. Its greatest breadth is about ninety miles. At the upper end it narrows to a width of three miles, and at its head is Fort Augusta. At the lower end it again narrows between Eyre Peninsula, on the west, and York Peninsula, on the east.

SPENCER, EDMUND (1552-1599), one of the foremost English poets of the Elizabethan Age, was born at East Smithfield, London.

In 1576 he received from the University of Cambridge the degree of M. A., and shortly afterwards became a member of the household of the Earl of Leicester. He was introduced at court by Sir Philip Sidney, to whom he dedicated his *Shepherdes Calendar*, published in 1579. In 1580 he went to Ireland, as secretary to Lord Grey, deputy of the island, and had a part in restoring peace after Desmond's rebellion. A large part of Desmond's forfeited estate was given him by the government, and on it he lived after 1586.



EDMUND SPENCER

Here he worked on the *Faerie Queene*, the first three books of which were published in 1590, with a dedication to Queen Elizabeth. He then passed two or three years in Ireland, where, in 1594, he married. His courtship is celebrated in eighty-eight sonnets, and his marriage in *Epithalamium*, the finest wedding song in the English language. After another visit to London, in the course of which he published three more books of the *Faerie Queene* and his *Foure Hymnes*, Spenser returned to Ireland, and in September, 1598, he was appointed sheriff of the County of Cork. The rebellion of Tyrone, however, took place in October; Spenser's house was fired by the populace, and, according to some accounts, his child perished in the flames. The poet arrived in England with body and spirit broken by these misfortunes, and he died in the following January. He was interred in Westminster Abbey, near Chaucer. As a poet, although his minor works contain many beau-

ties, Spenser will be judged chiefly by the poetical allegory, the *Faerie Queene*. It was the poet's intention that this work should embrace twelve books, each setting forth a cardinal virtue embodied in a knight. Only six were written, besides two cantos of *Mutabilitie*. It is supposed that part of the unfinished poem may have perished when the poet's house was sacked and burned. Because of his great influence on his successors Spenser has been called "the poet's poet."

SPERMACETI, *spur ma s'ete*, a substance resembling wax, found in the cavities of the head and in the blubber of the sperm whale. It is used in making candles, ointments and face creams. In the living animal this material occurs in combination with a thick oil; on exposure to air the spermaceti separates from the oil in white flakes. When purified, this substance becomes a semi-transparent solid, in appearance resembling tallow. Some of the larger whales have yielded twenty-four barrels of spermaceti. See SPERM WHALE.

SPERMATOPHYTES, *spurm'a toh fites*. See PHANEROGAMOUS PLANTS.

SPERM OIL, the oil of the sperm whale, which is separated from the spermaceti and the blubber. This kind of oil is much purer than train oil and burns away without leaving any charcoal on the wicks of lamps. In composition it differs but slightly from common whale oil.

SPERM WHALE, or **CACHALOT**, *kash' a lot*, a species of whale belonging to the section of the whale order denominated *toothed* whales. The sperm whale is generally met with in the Pacific, but occasionally it is also found on the coast of Greenland. The large blunt head in an old male is sometimes thirty feet long, about a third of the total length of the body. *Blow holes*, or S-shaped nostrils, are situated in the front part of the head. The weight of an adult animal is estimated to be about 200 tons. This whale is valuable for its oil and for a substance from the head, known as *spermaceti*. See SPERMACETI; WHALE.

SPHERE, *sfeer*, a geometric solid bounded by a surface every part of which is equally distant from a point called the center. It may be conceived to be generated by the revolution of a semicircle about its diameter, which remains fixed and which is called the *axis* of the sphere. A section of a sphere made by a plane passing through its center is called a *great circle* of the sphere; and

when the cutting plane does not pass through the center the section is called a *small circle* of the sphere. The surface of a sphere is equal four times the area of its great circle.

SPHE'ROID, a body or figure resembling a sphere, but not perfectly spherical. In geometry it is a solid generated by the revolution of an ellipse about one of its axes. When the generating ellipse revolves about its longer or major axis, the spheroid is *oblong*, or *prolate*; that is, it has protruding poles; when it revolves about its minor axis, the spheroid is *oblate*, that is, has flattened poles. The earth is an oblate spheroid with polar diameter shorter than the equatorial.

SPHINX, *sfinx*, a fabulous monster which figures in Greek and in Egyptian mythology. The Greek sphinx had a lion's body and paws, the head of a woman, the tail of a serpent and wings of a bird. The monster was said to live on a cliff overlooking the road to Thebes. To every one who passed she put a riddle, and devoured all who could not answer. Oedipus, when asked the riddle, "What animal is it that walks on four legs in the morning, two at noon and three in the evening," replied: "Man, for he walks on his hands and feet when young, erect on two feet in middle life and with the help of a stick in old age." Infuriated that her riddle was correctly answered, the sphinx hurled herself from the cliff and was killed.

The Egyptian sphinx had a lion's body, feet, legs and tail and the head of a man. It was always represented in a recumbent posture, with forepaws stretched forward. The sphinxes often stood in pairs guarding the entrances to temples. The largest sphinx, that near the group of pyramids at Gizeh, is about 150 feet long and sixty-three feet high; the body is hewn out of stone, but the paws, which are thrown out fifty feet in front, are constructed of masonry. The face, fourteen feet wide, has been badly mutilated, but notwithstanding this the figure is one of the most impressive monuments of Egypt. See PYRAMID.

SPHINX MOTH, a species of hawk moth, deriving its popular name from a supposed resemblance which its caterpillars present to the Egyptian sphinx, when they raise the fore part of their bodies. See HAWK MOTH.

SPHYGMOGRAPH, *sfig'mo graf*, an instrument for measuring the force and fre-

quency of the pulse. A strip of paper moved by clockwork passes under a pencil which moves from side to side describing an irregular wavy line on the sheet. The exact effect of certain external stimuli and of medicines is indicated by this delicate little instrument.

SPICE, the name given to a group of vegetable seasonings, including pepper, mace, nutmeg, cloves, ginger, allspice, cinnamon, capsicum and mustard. Some are produced from seeds, as mustard; some from bark, as cinnamon; some from root, as ginger; and some from fruit, as nutmeg. Spices contain a very small percentage of nourishment; they are valuable for food only because of their stimulating effect on the digestive organs. Employed in moderation they are wholesome, but are injurious if used in excess.

Related Articles. Consult the following titles for additional information:

Allspice	Cassia	Mustard
Anise	Cinnamon	Nutmeg
Caper	Cloves	Paprika
Caraway	Ginger	Pepper

SPICE ISLANDS. See **MOLUCCAS**.

SPIDERS, the common name of animals often classed with the insects, but really constituting a class by themselves, the Arachnida.

Characteristics. The spider's head and chest are united to form one segment; no

filaments are drawn. With these filmy threads the spider makes its web, which is intended to entangle prey or to serve as a house for the industrious little animal. Spiders have four pairs of legs and no antennae. Most of them have eight eyes, borne on the front of the head. Their mandibles are terminated by a little hook, near which is a gland secreting a poisonous fluid by which the spider kills its prey. The female spider is much the larger, and the males rarely approach for fear of being devoured. The eggs are numerous and are usually hidden in cocoons, which are carried by some mothers until the eggs hatch. Often the countless young live upon the mother's back in such masses that they make her appear very much larger than she is.

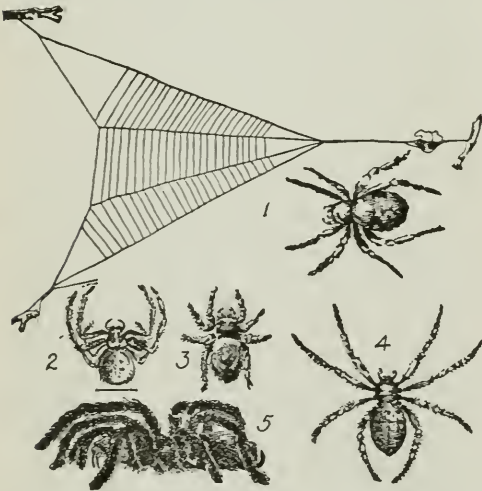
Habits. Spiders are exceedingly interesting animals, and many species have developed remarkably intelligent ways of living. The tropical species are very large and powerful, some being able to capture small birds. The common garden spiders spin perfect geometric webs. When a fly is entangled in one of these, the spider darts out, throws another web about the intruder, kills it, sucks its blood, throws away the body and repairs the web in a very short time. Some species run with great speed; others leap many times their own length, to seize their prey. They are quarrelsome and often fight to the death. If their limbs are torn off; others may grow again. The water spiders inhabit fresh-water pools, where they live in skilfully constructed nests, looking like small diving bells, suspended mouth downward into the water.

Related Articles. Consult the following titles for additional information:

Antennae	Tarantula
Arachnida	Trapdoor Spider
Spider Web	

SPIDER WEB. To spin its web, the spider raises its spinnerets in the air, and the gentle pressing of them against an object causes the exudation of what may be described as liquid silk. Upon contact with the air, the threads harden and unite into one strand. This thread becomes a sort of suspension bridge which the spider tightens with its claws and cements firmly to a beam, leaf or wall. On several of these strands a gossamer net is spun.

The web of the common house spider consists of numerous criss-cross strands interwoven around the supporting spokes and forming an irregular wall around a central



SPIDERS

- 1. Triangle spider and web.
- 2. Crab spider.
- 3. Jumping spider.
- 4. Large o. b. weaving spider.
- 5. Tarantula.

wings are developed, and the abdomen is furnished with from four to six cylindrical or conical glands or spinnerets, from the minute openings in which extremely fine, silky

space. The spider repairs with great alacrity any broken portion of its web. However, after it has spun several webs, it exhausts for a time its supply of silky fluid and often adopts predatory methods in taking possession of some other spider.

The orb web of the large black and yellow garden spider is the most delicate and skillfully constructed. It is geometric and consists of fine spiral strands fastened to spokes, similar to those of a wheel, and affixed to a branch or leaf with threads. That insects hitting against it may be trapped, the net is hung vertically. As the spider is enabled to run on the radiating strands of its web, it is never enmeshed; and the insect is held captive by minute, pearl-like drops of the glutinous substance.

Young spiders spin the single shining threads often seen suspended between grass stalks. Threads of silk cast off into the air by these spiders often float away with the breeze, and, spinning more threads as they go, they are blown to new areas. Thus the *flying*, or *ballooning spiders*, sail through the air and distribute themselves over the globe. The spider does most of its spinning at night or in the early hours of the morning.

SPIKENARD, or **NARD**, a perfume obtained from a plant of the valerian order, native to the East Indies. The plant has a fibrous root stock or spike, from which grow several thick stems about two inches long. These highly aromatic stems

are the source of the perfume. This is the true spikenard of the ancients, used by the Romans in their baths and by Eastern peoples. It is still highly prized in the Orient,

where it has been used for centuries to perfume ointments. The spikenard mentioned in the Bible was probably an unguent perfumed with this odor. It was worth approximately fifty dollars a pound.

In the southern part of Canada and the northern sections of the United States there is a similar plant with large aromatic roots which are used in making a tonic. This plant is called *American spikenard*, or *Indian root*.



SPIKENARD

SPINACH, *spin'ayj*, or *spin'ach* (the first preferred) is a garden vegetable, cultivated for its leaves, which are used for greens and in making soup. There are two varieties, the prickly spinach and the smooth spinach. The latter is the variety more generally used. It has round, blunt leaves and a smooth fruit. For early spring use, the seed is sown in the fall, usually in drills about a foot apart. In the spring the plants grow rapidly and are ready for market in a few weeks. Spinach needs a fertile soil, for if it grows slowly the leaves are tough and bitter. The food value is slight, but it has a slightly tonic effect, and its delightful flavor makes it a desirable article of food. The plant is supposed to be a native of Asia, and it was first cultivated in Arabia.

SPINAL CORD, the nervous cord which extends from the brain along the back side of the spinal column, and from which all the important nerves and systems of nerves branch. At the center of the cord is a tiny canal, which is connected directly with the cavities of the brain. Next to it is the gray matter, and around this is the so-called white matter, which is composed only of nerve fibers. See **BRAIN**; **NERVOUS SYSTEM**.

SPINNING, the making of thread or yarn by twisting the fiber of wool, flax, cotton, silk or other material, has developed into a great modern industry from a humble household occupation.

The Evolution of the Spinning Wheel. In earliest times spinning was accomplished by the use of the distaff and the hand spindle. The fiber, when spun, was wound upon the distaff, and the spindle, consisting of a round stick tapering at each end, with a notch for fixing yarn or thread at the upper end, was held in the hand and rotated by a movement against the right leg, while the left hand of the spinner gathered and supplied the fiber. The first improvement upon this device was the fixing of the spindle horizontally in a frame, causing it to rotate rapidly by means of a band that passed around a large wheel. This was the beginning of the spinning wheel, which is supposed to have been invented sometime in the sixteenth century (see **SPINNING WHEEL**). The treadle was added later, thus giving the spinner both hands with which to manipulate the thread.

The first spinning wheels contained only one spindle, but those with two spindles were

afterwards invented. The next great invention in spinning consisted of the spinning jenny, invented by Hargreaves (see SPINNING JENNY). This made possible the spinning of a large number of threads at once. Later Hargreaves's invention was improved upon by the invention of the water frame, which made an even and finer yarn. The mule-jenny, which is the basis of all spinning machines now in use, consists of a combination of the spinning jenny and the water frame. By means of these inventions the art of spinning was very materially advanced, and one operator could produce as much yarn in a day as fifty or more working by the old method.

Modern Methods. The size of the yarn and the forms of the twist are determined by the speed with which the machine operates and the rapidity with which the thread is drawn out, rapid motions producing a fine, hard-twisted yarn, while slow motions produce a coarse and more loosely twisted product. While it is possible to regulate spinning machines, so as to have them yield yarn of different grades, in large manufactories it is found more economical to construct each machine for the manufacture of a particular grade and to devote it entirely to that purpose. This makes feasible the construction of simpler machines, and the work can be accomplished more rapidly. See CLOTH; WEAVING.

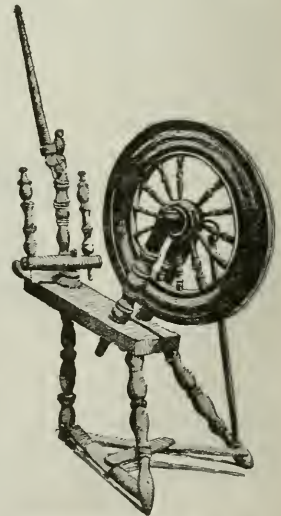
SPINNING JENNY, the name given to the first spinning machine by means of which a number of threads could be spun at once. It was invented about 1767 by James Hargreaves, a Lancashire weaver, and consisted of a number of spindles turned by a common wheel or cylinder worked by hand. Later it was replaced by the mule-jenny. See SPINNING.

SPINNING WHEEL. A machine for spinning wool, cotton or flax into threads by hand. It consists of a wheel, a hand and spindle. The wheel for spinning flax has a distaff attached and is driven by the foot; but the wheel for spinning wool is driven by hand. The spinner turns the wheel with the right hand, and holds the wool, which is in the form of rolls about three feet long and a half-inch in diameter, in the left hand. The degree of fineness of the yarn is determined by the rapidity with which the thread is drawn out by a backward movement of the spinner.

SPINOZA, *spe no' zah*, BARUCH BENEDICT (1632-1677), a Dutch-Jewish philosopher, born at Amsterdam, whither his parents had fled from Catholic persecution in Portugal. He was carefully trained in Jewish theology, but after reading Descartes and Bruno he turned from the Jewish faith. Expelled from the Israelitish community, he fled from Amsterdam to the suburbs to escape the enmity of the fanatical Jews, and after five years' seclusion he removed to Rhynsburg. Finally he settled in The Hague, where he died. By his skill as a grinder of optical lenses, he managed to earn a living. He refused a pension from the French king and a professorship in Heidelberg, because their acceptance might interfere with his freedom of thought and conduct, but he accepted a legacy from his friend De Vries. This annuity enabled him to devote a large part of his time to the study of philosophy.

In 1670 he published anonymously *Tractatus theologico-politicus*, a practical political treatise, designed to demonstrate the necessity, in a free commonwealth, of freedom of thought and speech. This work called forth such a storm of adverse criticism that Spinoza published nothing further. After his death all his unpublished writings were published. *Ethics Demonstrated in the Geometrical Order*, which he had completed in 1674, is his most famous work and the one containing his metaphysical system. The essence of this system is that God is identical with the universe.

SPIRAEA, *spi re'ah*, a class of herbs and shrubs of the rose family, found in the north temperate zone. There are about sixty species, adapted to a wide range of soil and conditions. Well-known varieties are *dropwort*, *meadow-sweet*, *hardhack*, *saxifrage* and *shadbush*. The flowers grow in clusters of various forms and may be white or pink.



SPINNING WHEEL IN THE HOME OF GOVERNOR CARVER

Several species are among the showiest of American shrubs. The steplebush, with its spirelike clusters of tiny white flowers; the Douglas spirea, with whitened leaves; the bridal wreath, with its dainty, graceful, downward curving stems covered with little leaves and bearing profusely drooping clusters of tiny feathery white flowers—these are favorites. They are much used in landscape gardening, especially in city parks.

SPIRE, the tapering part of a steeple, which rises above the tower. It had its beginnings in the pyramidal or conical roofs on eleventh-century buildings in the Romanesque style, specimens of which still exist. These roofs, becoming gradually elongated and more and more acute, resulted at length in the elegant, tapering spire. The spires of medieval architecture, to which alone the term is appropriate, are generally square, octagonal or circular in plan; they are sometimes solid, more frequently hollow, and are variously ornamented with bands, with panels, more or less enriched, and with spire lights.

SPIRITUALISM, the belief that communication can be held with disembodied spirits. It is of ancient origin, but in its limited and modern form, it dates from the year 1848. In that year a Mr. and Mrs. Fox, who lived with their two daughters at Hydeville, N. Y., were disturbed by repeated and inexplicable rappings throughout the house. At length, according to the history of this belief, one of the daughters reported that the raps were intelligible; that the unseen "rapper" was the spirit of a murdered peddler. When this phenomenon was made known, a belief that intercourse could be obtained with the spirit world became general, and numerous "spirit circles" were formed in various parts of America. The manifestations thus said to be obtained from the spirits were rappings, table turnings, musical sounds, writings and the unseen raising of heavy bodies.

The peculiarity of these phenomena was that they were always more or less associated with a *medium*, that is, one who was supposed to have an organization sensitively fitted to communicate with the spirit world. Daniel D. Home possessed unusual powers and was said to be able to float up to the ceiling or out of the window into the next room. Such claims not only attracted the curious and converted the unthinking, but also received the attention of legal and scientific men.

Judge Edmonds and Professor Hare undertook to expose fraud in connection with the manifestations, but both had to admit the genuineness of a slight part of the evidence; while in England, such scientists as A. R. Wallace, Sir William Crookes and Professor DeMorgan professed belief in the genuineness of the phenomena. The believers in spiritualism are most numerous in England, where investigations are made by the Society for Psychical Research and the results annually published in a volume of Proceedings. In the United States, the Spiritualists number about 250,000. Spiritualism has been greatly discredited owing to the fact that many impostors purporting to have mediumistic powers have carried on "confidence games" at the expense of the public.

The best recent books on spiritualism are *Human Personality and Its Survival of Bodily Death*, by F. W. H. Myers; *The New Revelation*, by Sir Arthur Conan Doyle; *Spiritualism; Its History, Phenomena and Doctrines*, by J. Arthur Hill; *Raymond*, by Sir Oliver Lodge; and *Psychical Phenomena and the War*, by Hereward Carrington.

SPIROMETER, a contrivance for determining the capacity of the human lungs; that is, for measuring the amount of air which can be expelled after a deep breath is taken. The instrument most commonly employed consists of two cylinders, one inverted and of a size that will allow it to move freely up and down with the other. The lower cylinder is filled with water, and to the top of the upper a tube and an air cock are attached. When air from the lungs is blown into the tube, this cylinder rises. A graduated scale marks the number of inches which the cylinder rises, and the diameter being known, the number of cubic inches of air expelled from the lungs is easily determined.

SPITHEAD, *spit'ed*, a roadstead off the southern coast of England, between Portsmouth and the Isle of Wight. It is fourteen miles long and four miles wide, and is a favorite anchorage of the British navy, being well sheltered from winds and protected by fortifications. The "spit," from which it takes its name, is a sandbank three miles long jutting southward from the Hampshire shore.

SPITZ, or **POMERANIAN DOG**, a small dog about the size of a spaniel, with erect ears, a foxlike face, sharp, pointed muzzle and a bushy tail, usually carried over the back. Its coat is soft and silky and may be

black, gray, red-brown or pure white. In its native province of Pomerania in Prussia, the Spitz is trained to tend sheep. In America the white variety with black-tipped nose is valued as a pet.

SPITZBERGEN, *spits burg'en*, a group of islands in the Arctic Ocean, situated about 400 miles north of Norway, between Franz Josef Land and Greenland. The largest islands are West Spitzbergen, Northeast Land, Edge Island, King Charles Land, King Charles Foreland and Hope Island. The highest elevations reach an altitude of 5,000 feet. The islands are icebound during the greater part of the year and are remarkable for the extensive glaciers found upon them. Recently they have become somewhat important as affording a starting point for numerous polar expeditions (see NORTH POLAR EXPLORATION). The sovereignty of the archipelago has never been decided, but valuable coal deposits have of late been exploited by English, American and Scandinavian companies.

SPLEEN, the largest of the ductless glands, in size about five inches in length and three or four in width, located in the upper part of the abdomen at the left of the stomach and between it and the diaphragm. It is oval in shape, of a bluish red color, is soft and spongy in composition, and easily crumbled. The functions of the spleen are obscure. It probably stimulates digestion through its secretions, stores up nutriment and aids in the production of blood corpuscles, especially those that combat certain diseases, as typhoid.

SPLICING, *splis'e'ing*, the process of joining two ropes without the use of a knot. The three chief varieties of splice are the *short splice*, the *long splice* and the *eye splice*. In making the *short splice* (Fig. 2) the ends of two ropes are unlaidd for a short distance and are then fitted closely together; by the help of a marlinspike, the ends of each are laced over and under the strands of the other. The *long splice* is made in the same manner, but the rope is unlaidd

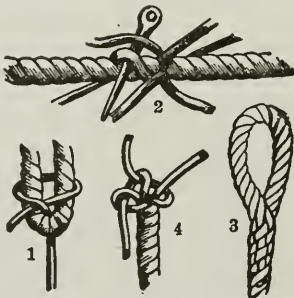
for a greater distance; hence the splice is stronger. The *eye splice* (Fig. 3) is made by bending over the end of the rope and lacing the strands into the rope where it is unlaidd. The eye may be oval or circular. The *becket hitch* (Fig. 1) is the easiest method of attaching a small line to a rope. The *single wall* (Fig. 4) is the simplest method of preventing the end of a rope from fraying.

SPOFFORD, AINSWORTH RAND (1825-1908), an American librarian, born in Gilmanton, N. H. He received a classical education and became associate editor of the Cincinnati *Daily Commercial*. In 1861 he was appointed first assistant librarian in the Library of Congress; in 1864 he became librarian in chief, and held the position until 1899. As a librarian Spofford became widely known for his comprehensive knowledge of books and their contents. He wrote largely for the periodical press and edited, with others, *Library of Choice Literature*, *Library of Wit and Humor*, *A Practical Manual of Parliamentary Rules and American Almanack and Treasury of Facts, Statistical, Financial and Political*. During his administration the national library increased from 70,000 to more than 600,000 volumes.

SPOKANE, *spo kan'*, WASHINGTON, the county seat of Spokane County and the second largest city of the state, is situated on the Spokane River, 314 miles east of Seattle and 309 miles northwest of Butte, Mont. It is served by the Northern Pacific, the Great Northern, the Chicago, Milwaukee & Saint Paul, the Oregon-Washington Railroad and Navigation Company and several lesser roads.

The city covers a tract of a little over twenty square miles and is beautifully situated on both sides of the river, which here flows through a gorge and forms a series of cascades, which are capable of developing large water power, as well as affording beautiful scenery. The streets are broad and regular and cross each other at right angles. In the business section of the city they are paved. The city has an excellent system of street railways, which connect all parts with the business center.

Buildings and Parks. Among the important buildings are a Federal building, a city hall, courthouse, an auditorium, the old National Bank, the Paulsen building,



the Davenport Hotel, a Masonic Temple, the Spokane and Athletic clubs buildings, the high schools and the churches, among which the Roman Catholic and Protestant Episcopal cathedrals are especially worthy of mention. The city has forty-three parks and eight playgrounds, whose combined area equals 1,985 acres. These parks contribute much to the beauty of the city. Fort Worth, a military post within the city limits, occupies a site of over 1,000 acres.

Education. The city maintains an excellent system of public schools, and in addition to these the following educational institutions are of importance: Gonzaga College and the Academy of the Holy Name, both Roman Catholic, Burnot Hall, Saint Stephen's and the Lyons School for boys. Of all these institutions Gonzaga College is the most important. There are also a number of business colleges, and the city has a Carnegie Library of over 65,000 volumes, besides the libraries connected with the various schools.

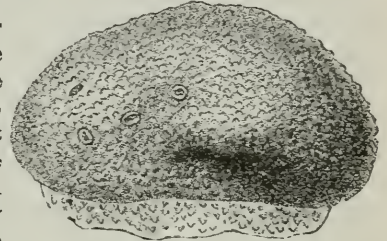
Industries. Spokane is an important distributing center for a wide range of country, including eastern Washington, northern Idaho and northeastern Oregon. Within this territory are many important mines, as well as large areas of rich agricultural lands. These conditions give the city a large trade. The falls are capable of developing about 60,000 horse power, and about one-half of this is now utilized in generating electric power, some of which is used in the city and some carried to the Coeur d'Alène mines, 100 miles distant. The leading manufactures include paper and wood pulps; bakery products; brick, lime and sewer pipe; lumber and lumber products, and flour and grist mill products. There are also many smaller manufactures.

History. The first settlement was made in 1873, and was named Spokane Falls. The town grew slowly until the opening of the Northern Pacific Railroad in 1881; it was then incorporated as a city. In 1889 a fire nearly destroyed the business center, but it was soon rebuilt on a more permanent plan. Like many other western towns, the city also suffered from overdevelopment, but when these crises were past, Spokane entered upon an era of steady and continuous prosperity. The commission form of government was adopted in 1910. Popula-

tion, 1910, 104,000; in 1917 (estimated), 199,160.

SPONGE, *spunj*, a jellylike sea animal, belonging to the order Coelenterata. There are numerous species (see COELENTERATA), but what is known as the sponge of commerce is the skeleton of the animal.

Construction. When examined, a common sponge is found to contain numerous tubes extending into it in all directions. The smaller tubes unite to form larger ones; and if the sponge is cut open, it is found that these all join together into one or more large tubes that radiate through the body from side to side.



SPONGE

In the living sponge these tubes are lined with the flesh of the animal. The cavities in the small tubes contain many digestive tracts, or stomachs, where the food is assimilated.

In the network of the fibers forming the sponge proper are found many spicules of silica and lime. In some these spicules of silica are so numerous as to give to the sponges a glasslike appearance, and when arranged in rows, like stars, they are very beautiful; such are the *glass-rope* sponge and *Venus's flower basket*. Sponges reproduce by means of eggs, formed by the layer of tissue which secretes the skeleton.

The Sponge of Commerce. The best sponges are obtained from the Mediterranean and Red seas, where they live in deep, clear water, from 150 to 200 feet below the surface. The methods of securing them vary in different localities. The old method of diving is to have two men go out in a boat, one of whom attaches a weight to his feet and descends to the bottom of the sea, where by rapid movements he gathers a few sponges and places them in a basket. He then gives a signal to the man in the boat, who hauls him up. By more recent methods, a diving dress is used, which enables the collector to remain under water a long time. Where the water is not too deep, the sponges are secured by spears or prongs, attached to long handles. The fisher uses a bucket with a glass bottom, which, when placed on the

surface of the water, enables him to see to a depth of sixty or more feet. When a sponge is discovered, he breaks it off with his prong and brings it to the boat. The sponges are either buried in warm sand or allowed to lie in the sun, until the flesh has thoroughly decomposed. They are then cleaned and beaten to expel all extraneous matter and are then dried and marketed.

Florida Sponge Industry. Nearly all of the sponges used in the United States come from Florida and the Bahama islands. The Florida fisheries have an annual output of about 623,000 pounds, approximating about \$545,000 in value. The best grades of Florida sponges, known as *sheep's wool*; are worth from two to five dollars a pound; the *yellow sponge*, from fifty to sixty cents, and the *coarse grass sponge*, from fifteen to twenty-five cents per pound. As many of the richest sponge beds are nearly exhausted, the United States government has passed laws to protect the Florida sponge fisheries against abusive fishing methods. Scientists are experimenting with artificial production because of the imminent shortage.

The World War greatly stimulated the Florida sponge industry on the Gulf coast, because of the difficulty of obtaining the Mediterranean output. Tarpon Springs became a great center of activity, and the work was carried on mainly by Greeks, who adopted the newer method of the diving apparatus. Many of the more intrepid divers plunged into water over one hundred feet deep and brought up choicest specimens.

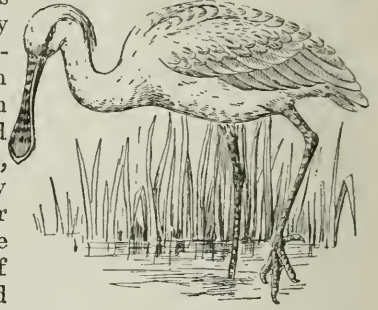
SPONTANEOUS COMBUSTION. Jute, heaps of rags and similar substances, when saturated with oil, turpentine or varnish, and bituminous coal, when moistened with water, often begin to burn without having been ignited by some outside agency. Ignition of this sort is called *spontaneous combustion*. The cause of the fire is the mixing of the carbon and the hydrogen with the oxygen of the air so rapidly as to raise the temperature to the ignition point.

SPONTANEOUS GENERATION, *jen ur a'shun*, or **ABIOTENESIS**, *ab e o jen'e sis*. At various times it has been thought that life could be created or produced from matter not itself alive. As recently as the seventeenth century it was thought that maggots on decaying meat were an example of spontaneous generation. With the rise of the science of bacteriology scientists have come to the con-

clusion that a living organism, no matter how minute, cannot come into existence without ancestry. See **MOLD**; **PROTOPLASM**.

SPOONBILL, a wading bird of the heron family. It takes its name from its spoon-shaped bill, which it dips about in the water, picking up marine insects and small shellfish.

Spoonbills are shy birds, living in flocks in wooded marshes, usually not far from the mouths of rivers, and on the sea-



SPOONBILL

shore. A beautiful species is the *roseate spoonbill*, found in the warmer regions of the North American continent. The plumage of the bird's body is rosy pink; that of the wings, carmine. The glistening whiteness of the neck extends a short distance on the back. The birds build their nests, which are rough, flat structures of sticks, in low branches. They return year after year to the same breeding places, and owing to this habit they have been easily located and nearly exterminated by plume hunters. In the United States the name spoonbill is sometimes given to the shoveler duck.

SPORE, *spohr*, in botany, a minute cell body by means of which reproduction of seedless plants is carried on. A typical spore is a mass of protoplasm with a nucleus and cell wall. Plants that reproduce by spores are called cryptogams (see **BOTANY**, page 516), and are represented by the algae, ferns, mosses and lichens. There are two main classes of cryptogamous plants—those containing green coloring matter, or chlorophyll, essential in the production of plant food; and those that are parasites and derive their nourishment from the plants on which they grow. Among the parasites are corn smut and wheat rust. In the higher cryptogams reproduction proceeds in much the same way as it does among lower orders of seed-bearing plants. Among the lower cryptogams reproduction is frequently a matter of cell division.

SPOTTSYLVANIA COURT HOUSE, *spot sil va' ni a*, **BATTLE OF**, a battle of the

Civil War, fought in May, 1864, near Spottsylvania Court House, Va., about fifty miles from Richmond, between a Federal force under Meade and the Confederate Army of Northern Virginia under Lee. After the battle in the Wilderness, Grant had ordered a movement around Lee's right wing to Richmond. Lee, however, was prepared for this maneuver and was in formation at Spottsylvania before Grant reached that



SPOTTSVYLVANIA COURT HOUSE

point. The contest was opened by the Federal General Hancock, on May 7, and the fighting was continued intermittently until May 12. The Federal losses at Spottsylvania were nearly 7,000; the Confederates lost more, but held their position. It was in the course of this battle that General Grant sent his famous dispatch to General Halleck at Washington: "I propose to fight it out on this line if it takes all summer." See CIVIL WAR IN AMERICA.

SPRAIN, *sprane*, an injury to a joint in the body by which the ligaments holding the bones in place are strained or torn. The ankle because of the great weight it sustains is the joint most frequently injured by a sprain. Sprains in some joints are much more difficult to heal than in others. Inflammation, swelling and pain follow a sprain and sometimes are exceedingly severe. The application of hot or cold water will often take out the soreness, and complete rest will bring a cure, unless the ligaments have been so badly torn that splints are necessary, as in a case of fracture. In such cases the use of strips of adhesive plaster put on before swelling becomes serious will often do away with the necessity for splints or a plaster cast.

SPRAT, a small fish of the herring family, rarely more than six inches long. At one time the sprat was thought to be the young of the herring, the pilchard or the shad, but it can be easily distinguished from the young of

any of these fishes by means of the sharply-notched edge of the abdomen. It is found in the North Atlantic and Mediterranean and on the southern coasts of the United States. It is considered a delicious, well-flavored and wholesome fish.

SPRING, the season of the year between winter and summer, beginning with the vernal equinox, about March 21, and ending with the summer solstice, about June 21.

SPRING, a stream of water flowing from the earth. Springs have their origin in the water that falls upon the earth in the form of rain or snow, which sinks through porous soils till it arrives at a layer of rock through which it cannot pass, where it forms subterranean reservoirs at various depths. When the pressure of the water which fills the channels through which it has descended is sufficient to overcome the resistance of the overlying mass of the earth, the water breaks through the upper strata and gushes forth in a spring. It may find some natural channel or crevice through which to issue.

In descending and rising through various mineral masses, the water of springs often becomes charged with gaseous, saline, earthy or metallic substances, as carbonic acid gas, sulphureted hydrogen gas, nitrogen, carbonate of lime, silica and carbonate of iron. When these substances are present in considerable quantity, the springs become what are known as *mineral springs*, of which Saratoga Springs, New York, and the springs of Carlsbad, Bohemia, are good examples (see MINERAL WATERS). Warm and hot springs are common, especially in volcanic countries (see THERMAL SPRINGS).

Some springs run for a time and then stop altogether, after a time run again and again stop; these are called *intermittent springs*. Others do not cease to flow, but discharge a small quantity of water for a certain time and then give out a greater quantity; these are called *variable springs*. Springs are most numerous in mountainous and hilly regions, where the underground water finds ready outlets. See ARTESIAN WELL.

SPRING, an elastic body used for relieving concussion, for furnishing motive power, or for controlling the motion of machines. Springs are made of various materials, such as steel wire, coiled spirally; steel rods or plates or strips of steel, suitably joined, as in the springs for carriages and railway cars; masses of India rubber, which, because of its

elasticity, will resume its former position as pressure is removed.

There are many patterns of springs, ranging from the delicate hairspring in the watch to the heavy springs found in locomotives. In the ordinary gunlock, the spring imparts motion to the hammer by being suddenly released from a strong tension. In the spring balance, the spring indicates the weight of the object placed on the scale pan. In the safety valve, it indicates the pressure of steam in a boiler and causes the valve to open at the proper time. Numerous other uses of the spring are also common.

SPRINGBOK, a species of antelope, closely allied to the gazelle, formerly found in vast herds in South Africa. Both the flesh and the hide are valuable, and it is therefore much hunted. It is a beautiful animal, of graceful form and fine colors—dull brown on the upper parts and pure white beneath,



SPRINGBOK

with a broad band of deep red where the colors meet on the flanks, and a white band extending down the back. It is larger than the roebuck, and its neck and limbs are much longer and more delicate. The horns are slightly curving and are small in the female.

SPRINGFIELD, ILL., the capital of the state, the fourth city in size, ranking after Chicago, East Saint Louis and Peoria, and the county seat of Sangamon County. It is 185 miles southwest of Chicago, on the Baltimore & Ohio Southwestern, the Chicago & Alton, the Illinois Central, the Chicago, Peoria & Saint Louis, the Cincinnati, Hamilton & Dayton and the Wabash railroads. The city is compactly built and regularly laid out,

with wide, beautiful, shaded streets. The most prominent structure is the state capitol, with a massive dome, 364 feet high. The magnificent Lincoln monument and mausoleum, which contains the remains of the martyred President, his wife, two children and one grandson, is located about a mile and a half from the capitol, in Oak Ridge Cemetery. The old capitol, now serving as the county courthouse, and the Lincoln residence, which is owned by the state, are interesting features.

The educational institutions include the Bettie Stuart Institute, Concordia Seminary, Saint Agatha's School, the Sacred Heart Academy and two business colleges. Other important buildings are the governor's mansion, a city hall, a postoffice, an Odd Fellows' Temple, an orphanage, two hospitals and a sanitarium. There are city, state and supreme court libraries and those of the State Historical Society, the Lincoln Library, and the Illinois State Museum of Natural History. A state fair is held here annually. The surrounding country is a rich farming and coal-mining region; the well-known Springfield watches are made here, and there are engine and boiler works, car shops, lumber mills, foundries, machine shops and other factories. Springfield was settled in 1819, was chosen as the county seat in 1823, was incorporated as a town in 1832, was made the state capital in 1837 and was chartered as a city in 1840. The commission form of government was adopted in 1911. Population, 1910, 51,678; in 1917, 62,623 (Federal estimate).

SPRINGFIELD, MASS., seventh city in size in the state and the county seat of Hampden County, is about 100 miles nearly west of Boston and 136 miles northeast of New York City, on the Connecticut River and on the Boston & Albany, the Boston & Maine, the Central New England and the New York, New Haven & Hartford railroads. It is a beautiful city and an attractive residence place, with wide and well-shaded streets, and park areas totaling over 600 acres. Forest Park covers an area of about 463 acres, and there are numerous small parks and public squares, containing a soldiers' and sailors' monument, statues of Miles Morgan and President McKinley and Saint-Gaudens's remarkable statue of *The Puritan*. Springfield has often been called "the City of Homes," for a smaller percentage of the population live in rented houses than in almost any other New England city.

Especially noteworthy among buildings is a municipal group, consisting of an auditorium, an administration building and a campanile. The tower contains a chime of bells, and is 300 feet high; the administration building seats 4,000 people and has one of the largest organs in the country. The group cost \$2,000,000. Among other structures of note are a Carnegie Library, an art museum, a science museum, a county courthouse, Church of the Unity, a Federal building, a union railroad station, a county law library, and a hall of records. Unique features of the educational system of Springfield consist in the evening trades' school, supported at public expense, a vocational school for boys, a technical high school, and three schools specially adapted to the needs of feeble-minded or backward pupils. The higher institutions of learning include the International Y. M. C. A. Training School, the American International College, two boarding schools for girls and three business colleges. The city is an insurance center, the home of the Springfield Fire and Marine Insurance Company and Massachusetts Mutual Life Insurance Company.

A United States arsenal was established here in 1795, and it employs in peace times from 1,400 to 3,000 men. The large Smith & Wesson revolver works are located here. The manufactures include railroad cars and supplies, paper, envelopes, buttons, art goods, electrical supplies, automobiles, cotton goods and many small wares. Within a radius of twenty-five miles are the cities of Holyoke, Northampton, Chicopee and Hartford, as well as many large towns and villages. Its location in reference to these towns makes Springfield an important commercial center. The place was settled in 1636 by people from Roxbury, under the leadership of William Pynchon. During King Philip's War it was attacked and burned, October 4, 1675. It was the scene of a riot in January, 1787, between the state troops and Shays's insurgents. The city was chartered in 1852. Population, 1910, 88,926; in 1917, 108,668 (Federal estimate).

SPRINGFIELD, Mo., the county seat of Greene County, 204 miles southeast of Kansas City, on the Saint Louis & San Francisco, the Kansas City, Clinton & Springfield, the Saint Louis, Iron Mountain & Southern and the Missouri Pacific railroads. It is located on a broad plateau in the heart of the Ozarks,

at an altitude of 1,140 feet, and is in the mineral belt of Southwestern Missouri. It is also the center of an extensive poultry industry, with annual shipments amounting to \$8,624,000. The leading manufacturing establishments are lumber and flour mills, furniture and wagon factories and railroad and reclamation shops. Drury College, Loretto Academy and a state normal are located here. A ten-story office building, the Frisco building, a court house, a Pythian home, a Federal building, a Carnegie Library, three hospitals, zoological gardens and a large national cemetery are interesting features. The place was settled about 1819 as an Indian trading post, and was incorporated in 1833. The commission form of government was adopted in 1916. Population, 1910, 35,201; in 1917, 41,169 (Federal estimate).

SPRINGFIELD, OHIO, the county seat of Clark County, forty-five miles west of Columbus, on Lagonda Creek and Mad River, and on the Erie, the Cleveland, Cincinnati, Chicago & Saint Louis, the Detroit, Toledo & Ironton, and a number of electric railroads. The city is in a fertile farming district, has good water power and has been known for many years as a center for the manufacture of agricultural implements. Other industries include electric motor and motor truck factories, foundries, machine shops, flour and paper mills and publishing houses. Wittenberg College is located here, and the city has a ladies' seminary, several Catholic parish schools and two business colleges. Noteworthy structures are a city hall, a Federal building, a courthouse, the Bushnell Library and a Y. M. C. A. building. Near the city are state homes of the Masons, Odd Fellows and Knights of Pythias, and Memorial Home for Aged Women. The town was laid out in 1801, and was chartered as a city in 1850. It has the commission form of government. Population, 1910, 46,921; in 1917, 52,296 (Federal estimate).

SPRUCE, the name of a group of trees of the conebearing family, characterized by evergreen leaves, tall, tapering trunks and slender, horizontal branches. The leaves are stiff and pointed, and are arranged around the branch in a spiral. The bark is a dark or reddish brown, and is scaly. There are several spruces, of which the following are the most valuable:

The *Norway spruce* yields the valuable timber known under the name of *white*, or

Christiania, deal. It is a native of a large part of northern Europe, and is a noble tree, of conical habit of growth, reaching sometimes the height of 150 feet. The *white spruce* and the *black spruce* are both natives of North America. The latter attains the height of seventy or eighty feet, with a diameter of from fifteen to twenty inches. Its timber is of great value, on account of its strength, lightness and elasticity, and it is often employed for the yards of ships, the sides of ladders and very extensively in making paper pulp. The *Douglas spruce*, known among lumbermen as *Oregon fir*, is found in the northwestern part of North America, extending from Oregon into Alaska. It reaches a height of 100 to 150 feet, and next to the giant sequoia is the largest tree in America. Its lumber is valuable for many purposes. See HEMLOCK.

SPURGE FAMILY, or **EUPHORBIA-CEAE**, *u for be d'se ah*, a group of herbs, shrubs and trees, widely distributed over the globe and comprising about 4,000 species.



EUPHORBIA

Most of them have a biting, milky juice, which is of high commercial value, being the source of castor oil, croton oil, cassava and rubber. The plants have small, inconspicuous flowers, but some of them, notably the poinsettia, have brightly colored bracts. Some of the plants resemble cacti. The fruit, which is three-lobed, is dry and rather fleshy. Most of the tropical species are known as Euphorbias.

SPURGEON, *spur'jun*, CHARLES HADDON (1834-1892), a celebrated English preacher,

born at Kelvedon and educated at Colchester. When he was but a boy he began to preach, after having joined the Baptist Church; and in 1854 he became pastor of a chapel in New Park Street, London. Soon great crowds were going to hear him, and in 1861 the great Metropolitan Tabernacle, with 6,000 seats, was built to accommodate his large audiences. Here he preached for the remainder of his life.

CHARLES HADDON
SPURGEON

Besides his ordinary ministrations and the publication, after 1855, of a weekly sermon, he founded many benevolent societies, including the Stockwell Orphanage and the Pastors' College. In 1887 he severed his connection with the Baptist Union, on account of what he called the "down grade" tendency of the Church. He was the author of numerous volumes, of which the best known are *The Saint and his Savior*, *John Ploughman's Talk*, *Feathers for Arrows*, *The Treasury of David*, *Types and Emblems*, *The Metropolitan Tabernacle Farm Sermons*, *The Present Truth*, *Storm Signals*, *Salt Cellars*, *Speeches at Home and Abroad*.

SPY, in military usage, any person who by deception obtains or attempts to obtain information concerning a belligerent for the benefit of the enemy. A person is considered a spy only when he acts under false pretenses. A soldier who, for the time being, discards his own uniform and puts on the uniform of the enemy or some other disguise in order to penetrate the enemy's line is, according to international rules of warfare, a spy. If caught in the act he may be put to death after having received a fair trial and been proved guilty. No soldier or civilian is considered a spy who openly carries out a mission such as delivering a message across an enemy's territory, or reconnoitering over it in aeroplane or balloon. That which constitutes an enemy a spy is an act of deceit.

SQUADRON, a regulated arranged military body, specifically one of the divisions of a cavalry regiment, usually composed of

four troops. It is commanded by a major and includes from 120 to 200 men. The term is also applied to two or more war vessels detailed under a single command. See ARMY.

SQUARE, in geometry, a figure with four equal sides and equal angles. This figure is considered the unit for the measurement of areas, though actually the unit of area measurement is no longer considered to be perfectly square, but merely to contain the same amount of surface space as would a square figure whose sides were of the length of the corresponding linear unit.

To *square* a figure, a polygon, for example, is to reduce the surface to a square of equivalent area by mathematical means. This can be done by finding the area of the polygon and extracting the square root, the result being one side of the required square. To square a circle is impossible, but the attempt to do so was one of the first problems to engage the attention of the mathematicians of antiquity. In arithmetic and algebra the square of a number is the product obtained by multiplying a number by itself. Thus, 64 is the square of 8, for $8 \times 8 = 64$.

SQUARE MEASURE, the system of measurement used in measuring surfaces. It derives its name from the *square unit*, upon which the system depends. All measurements are based upon the square, and the area of any figure is found by resolving it into an equivalent square or rectangle. The two underlying principles of square measure are:

1. The area of a rectangular surface is equal to the product of its length by its breadth, expressed in square units.

2. When the area and one dimension of a rectangular surface are given the other dimension is equal to the quotient derived by dividing the area by the given dimension. See MENSURATION; WEIGHTS AND MEASURES; METRIC SYSTEM.

SQUARE ROOT. See ARITHMETIC, material for eighth year.

SQUASH, *skwosh*, a garden vegetable belonging to the gourd family. The plants, which are tough and robust, with large leaves and small yellow flowers, occur in two varieties, one a trailing vine, the other a bush. The *summer* squash, a bushy plant, produces a thin-skinned fruit, gourd-shaped or shaped like an acorn in its cup and sometimes twenty inches in diameter. *Winter* squash, usually of the vine variety, has a larger fruit, thick-skinned, which matures in the fall and,

when properly stored in a dry cellar, keeps through the winter.

Squash Bug, a name given to two species of insects, best known as destroyers of squash, pumpkin and other similar plants. The species which is particularly destructive in the United States is a cylindrical ill-smelling beetle, about half an inch long, with wing cases striped with black and yellow. The adults, dormant in winter, produce young in the spring, and these feed on the sap of the young plants. Killing the old bugs before the eggs are laid is a preventive outweighing any other remedy.

SQUATTER, *skwo'tur*, **SOVEREIGNTY**, or **POPULAR SOVEREIGNTY**, terms used in American history to denote the right of the inhabitants of any territory to govern themselves without Federal interference. The first term specifically relates to that right as applied to an unorganized territory, inhabited by so-called "squatters," that is persons who had taken up land without purchasing titles.

The doctrine of "squatter sovereignty" assumed importance during the slavery controversy, when it was championed especially by Stephen A. Douglas, who incorporated it into the Kansas-Nebraska Bill. In this bill it was declared that the people of the territories should have the right to decide whether slavery should be admitted or excluded. Though the theory was first proposed in order to protect the rights of slaveholders and to allow the extension of slavery, it was ultimately repudiated by the South, which was upheld by the dictum of Chief Justice Taney in the Dred Scott case. It finally led to a division between the Northern and Southern Democrats.

SQUID, *skwid*, a popular name for many species of ten-armed animals, especially the cuttlefish. The animal has a tapering body and a fin on each side of the tail. Some are of a bluish color, speckled with purple. The American squids range from Newfoundland to the Virginia coast and are much used as bait by codfishers. Excepting the cuttlefish, they are of no economic value.

SQUILL, a plant native to the Mediterranean shores and popularly called *sea onion*. It has large bulbs of medicinal value. Squill, formerly used in cases of croup and other bronchial affections, has been largely superseded by other remedies which are less stimulating to the heart and less irritating to the stomach and intestines.

The plant belongs to the lily family, has a spreading perianth, an ovary of three parts; in a three-cornered capsule are cells containing the seeds.

SQUINTING, or **STRABISMUS**, *strabismus*, a defect of sight in which the axis of vision in one eye is turned from its proper position in relation to the other. Individuals so afflicted are said to be cross-eyed. The normal position of the eye and its direction towards objects are controlled by four straight muscles; one is attached above the eyeball, one beneath, and one on either side. If one of these muscles becomes paralyzed, that on the opposite side turns the eye out



SQUILL

of its proper position and causes squinting. If one eye is defective or deformed, squinting is apt to arise from overstraining. The trouble is overcome by an operation, or by proper fitting of glasses; sometimes both methods of treatment are required.

SQUIR'REL, the name given to a large family of small attractive rodents, or gnawing animals. Squirrels are usually of a rich, ruddy brown or a dark gray on the upper parts, merging into reddish or grayish-white on the under parts of the body; the color, however, varies with the season and climate. The head is large, and the eyes are projecting and bright. These animals are found in all parts of the world except Australia, although much more numerous in America than in Europe.

Kinds of Squirrels. *Tree squirrels* are light and agile little creatures, with strong jaws, sharp teeth and long bushy tails. *Ground squirrels* do not ascend trees but burrow in the ground; the *chipmunk* is the best-known ground squirrel. The *common squirrel* inhabits Europe and the north of Asia; while the *cat squirrel*, the *gray squirrel*, the *black squirrel*, the *red squirrel* and the *great-tailed squirrel* are American

species. The *red squirrel*, or *chickaree*, is the most widely distributed of American squirrels; it is characterized by a shrill, noisy clattering. One oriental species is remarkable because it is the only animal which assumes a purely ornamental coat in the breeding season. It is gray in the summer and takes on a brilliant orange coat in early winter, changing to gray again in early spring.

Squirrel Habits. Squirrels subsist on nuts, acorns and seeds, of which they lay up a store for winter in hollow trees or in the earth. When engaged in eating, they sit on their haunches, with their tails thrown upward on the back, in which position they grasp the food with their fore paws and gnaw it with their powerful teeth. Their nests, which consist of woody fiber, leaves and moss, are usually located in the forks of trees. The young, of which there are three or four to a litter in a season, are born in June. The fur of some of the American



RED SQUIRREL

species, especially those of the north, is an important article of commerce. See **FUR AND FUR TRADE**.

STABAT MATER, Latin phrase meaning *the Mother Stood*, is a celebrated thirteenth-century hymn describing the sufferings of the mother of Christ as she stood by the Cross. The words, in Latin, are attributed to Jacopone da Todi, a follower of Saint Francis. The poem has been set to music by a number of composers, including Palestrina, Pergolesi, Haydn, Rossini and Dvorak.

STA'DIUM, the name originally given to the race course of Olympia, Greece, where athletic contests were held, and later ap-

plied to all places throughout Greece where such games were celebrated. The track was elliptical in shape, and about 600 feet long. At one end was a building with accommodations for the athletes; the remainder of the surrounding space was arranged in terraces or tiers of seats for the spectators. The word *stadium* was also used by the Greeks to denote a measure of distance, corresponding to the distance between the two terminal pillars of the race course. It was equivalent to a Roman mile.

The Athenian stadium was restored in 1906 for use in the revival of the Olympian games. Several other modern structures on the same plan have been erected, notably that at Harvard University, with a seating capacity of 40,000.

STADTHOLDER, *stat' holder*, a title formerly given in the Netherlands to the chief executive. In 1580, when Holland and Zealand revolted against Spain and united to accept William, prince of Orange, as their ruler, they called him *stadtholder* (literally, *one who holds a city*). Upon the assassination of Prince William, the title was conferred on his son, Prince Maurice, and it remained as the title of the ruler until Holland was annexed by France, in 1802. It was finally dropped in 1814, when the Prince of Orange was declared king of the Netherlands.

STAEL-HOLSTEIN, *stah'el hol'stine*, ANNE LOUISE GERMAINE, Baroness de, known in history as *Madame de Staël* (1766-1817), one of the most brilliant figures of eighteenth-century France. The daughter of Jacques Necker, Minister of Finance to Louis XVI, she was carefully educated and brought up in the most intellectual atmosphere of her time. In 1786 she married Baron de Staël-Holstein, Swedish ambassador at the French court. The marriage was not happy, and resulted in a friendly separation.

In 1788 Madame de Staël printed her *Letters on Jean Jacques Rousseau*. At the outbreak of the Revolution she exercised considerable political power, by reason of her father's high position at court and because of her own wit and womanly charm. To escape the Reign of Terror she fled to her father's estate in Switzerland, after vainly endeavoring to save her friends and the royal family. Afterwards she returned to Paris, where she again became an influence in politics. Subsequently she was banished by

Napoleon, on account of her bold advocacy of liberal views. Her husband died in 1802, and in 1811 she secretly married a young officer, De Roeca. This second marriage became known only after her death. Among her writings are the novels *Delphine* and *Corinne*, *On Germany*, *Thoughts on the French Revolution* and *Ten Years of Exile*.

STAFF, in military and naval usage, a body of officers not having command but attached in an advisory or executive capacity to a commanding officer. In the United States in time of war each military unit larger than a company—that is an army, a corps, a division or a brigade—has its headquarters and staff; each garrison, or body of troops stationed at a fort, also has its staff. A headquarters staff of an army in the field comprises a personnel staff of two or more aides-de-camp; ten officers, one of whom is *chief of staff*, and an adjutant-general, with his assistants. The composition of a garrison staff depends on the size of the garrison.

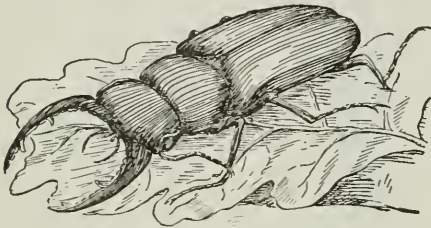
General Staff. This is a central administrative body created by Act of Congress in 1903. It is made up of four general officers, one of whom is chief of staff, four colonels, six lieutenant-colonels, twelve majors and twelve captains. It has supervision over all the bureaus of the War Department and considers all questions affecting the efficiency of the army. The chief of staff is the military adviser of the Secretary of War.

STAFF, a plaster resembling stucco, used as an outside covering for buildings and relief ornament. It is a mixture of plaster of Paris and hydraulic cement, and contains some dextrin and glycerine. Staff was used for covering the buildings of the Paris Exposition in 1889, the World's Columbian Exposition at Chicago in 1893, the Louisiana Purchase Exposition at Saint Louis in 1904 and those of the two California Panama Pacific expositions. It is comparatively cheap and light and can be molded into any desired form, but it is not suitable for the exterior of permanent buildings, as it lasts only a short time. See CEMENTS.

STAG, the name applied to the male of several species of deer, but commonly restricted in its application to the male of the red deer, after the animal has reached the age of five years, the age being indicated by the horns, which branch when it is fully mature. The female is called a *hind*, the young a *calf*. The full-grown stag is about four

feet high at the shoulders. His antlers, about three and a half feet long, constitute a dangerous weapon. They are shed annually, after the breeding season. In summer the back and flanks of the animal are yellowish-brown; in winter they are reddish-brown. These deer feed on grass, buds and young shoots of trees. The stags and hinds congregate in herds; old stags, called *harts*, roam alone. The North American *wapiti* is a related deer. See DEER.

STAG BEETLE, one of a large group of beetles, many species of which are found in North America. The male has enormous horny and toothed mandibles, which bear a certain resemblance to stag antlers. The



GIANT STAG BEETLE

giant stag beetle of the Southern states has mandibles an inch long, one third the length of the body. These beetles feed on the tender leaves and other succulent parts of plants. The eggs are deposited on trees, in the crevices of the bark, and when they hatch the small white worms burrow under the bark and feed on the soft substance beneath it, often causing the bark to peel off.

STAG HOUND, a large, powerful white hound, marked with black and tan, and probably bred from the bloodhound. As the name indicates, these dogs were formerly used for hunting deer. They have been largely replaced by foxhounds.

STAINED GLASS, glass colored in the making by some special chemical process or by the application of pigment to the surface of the finished article. Formerly all colored glass used in decorative windows was colored in the molten state. The molded glass was cut in shapes required by the design and the pieces were put together by means of lead strips. Such was the method in medieval times. To-day better results are achieved by painting, by graduating the thickness of glass, thus producing the effect of shading, and by fusing together colored slabs on a larger plate of colorless glass. All these devices obviate the necessity of breaking

the design up with numerous joining leads, and make possible larger panes of glass. The United States produces the best stained glass in the world. This is largely owing to the experiments of two men—John La Farge and L. C. Tiffany.

The effects obtained in the best stained glass of the present time surpass anything formerly achieved in this branch of art. It is chiefly in designs containing human figures that progress has been most marked. The soldered leads which formerly cut the figure into bits can now be made to coincide with the structural lines, and the effect is one of greater unity and coherence. Moreover, greater advance has been made in the perfection of color and in adapting it to opaque and translucent uses. Whereas in other periods stained glass was employed almost exclusively in connection with ecclesiastical architecture, it is to-day found in every type of public building and in some of the finest residences. The stained glass industry in the United States represents an investment of about \$3,000,000.

STALACTITE, *stalaktite*, a beautiful formation on the roofs of caves caused by the action of water containing lime, silica and iron. The water percolates through the rock, and as it evaporates, these substances solidify. Stalactites usually take the form of icicles, but occasionally they form columns extending from the roof to the floor of the cavern. Similar masses of small size are frequently to be seen, also, hanging from stone bridges. Simultaneously with the formation of the stalactite, a similar but upward growth, called a *stalagmite*, takes place at the spot where the successive drops of water fall and evaporate. See CAVE.

STALAGMITE, *stalag' mite*. See STALACTITE.

STAMFORD, CONN., a city in Fairfield County, thirty-three miles northeast of New York City, on Long Island Sound and on the New York, New Haven & Hartford railroad. The location is attractive, and many New York business men have their homes here. There is regular steamship connection with New York City. The place is well known for its manufacture of locks and keys, and it also produces drugs, dyestuffs, pianos, typewriters, insulated wire, paints, wood-working machinery, and foundry and machine shop products. It contains the Ferguson Library, a city hospital, Saint John's

Hospital and Home and several private sanitariums. Stamford was settled in 1641 by a company from Wethersfield, on the site of an old Indian village called Rippowam. It was made a borough in 1830 and was chartered as a city in 1894. Population, 1910, 25,138; in 1917, 31,810 (Federal estimate).

STAMMERING, a defect of speech due to lack of proper control of the muscles used in vocal articulation. It occurs in a number of forms, one that is most common being *stuttering*, which is rapid repetition of monosyllables or initial syllables of words beginning with *p*, *b*, *t* or *d*. Less frequent are the cases in which syllables are dropped, or those in which the afflicted person is momentarily stricken dumb. It is believed by some that the tendency to stammering is inherited, but the probabilities are that cases of stammering develop in children as the result of association rather than of heredity.

As in all other cases of nervous troubles, stammering can often be overcome. Sometimes it is found to be the resulting accompaniment of faulty eyesight, adenoids or other physical defect or ailment. A stammering child should have medical examination, and if the cause is physical and can be removed it should have attention, since to neglect treatment may be to allow a habit to become fixed, whereas timely aid may result in a cure. Stammerers always receive help by practicing breath control, and frequently by singing lessons. They need all the cooperation they can get from their fellows, for there is nothing quite so bad for one who stammers as the self-consciousness resulting from ridicule and impatience on the part of those around them.

STAMP, a small bit of paper bearing an imprint authorized by law and intended to be attached by a coating of gum to a dutiable or taxable article. Under the excise laws internal revenue stamps are required on snuff, tobacco and cigars; and in times of war many articles of commerce require revenue stamps. Sometimes legal documents also require government stamps and are void without them. At all times letters, papers or packages to be transmitted by mail must be stamped. See INTERNAL REVENUE; POSTAGE.

Stamp Act, an act regulating the imposition of stamp duties; specifically, an act passed by the British Parliament in 1765, requiring all legal documents, commercial papers and newspapers to be written or

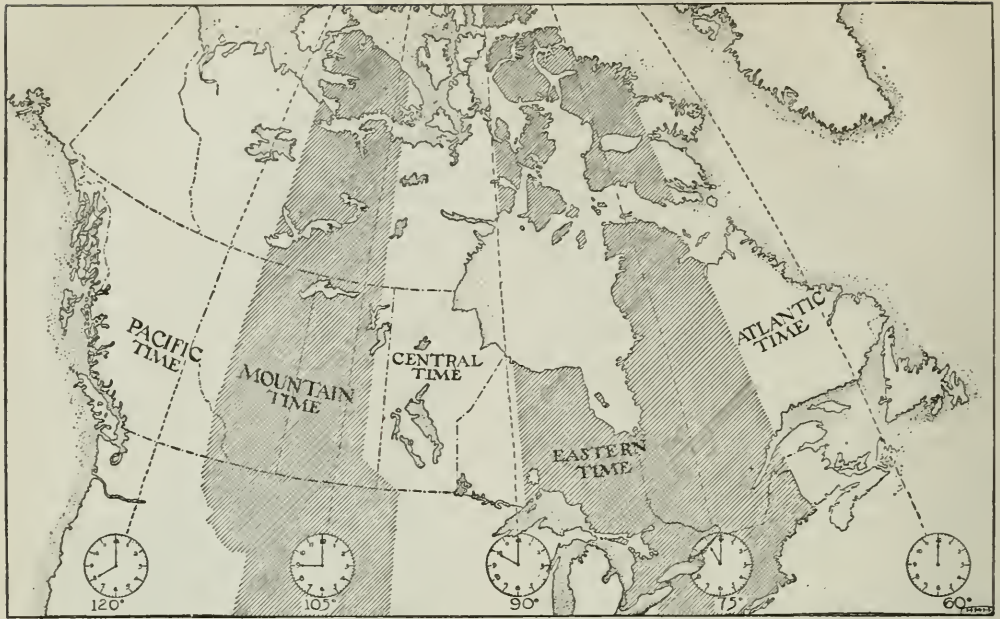
printed on paper stamped by the British government.

After the close of the French wars there grew up in England a feeling that taxes ought to be raised in America as a contribution to the war debt, and for the military defense of the colonies. The colonies expressed their willingness to be taxed by their own representatives in colonial assemblies, but declared they would not be taxed by Parliament—a body in which they were not represented; that taxation without representation was unjust.

The Stamp Act was proposed in March, 1764, and was passed in March, 1765. When the news was received in America, riots in opposition broke out. In October the colonies held a convention and sent an address to the king, acknowledging his sovereignty, but denying the right of Parliament to tax them. In March, 1766, the Act was repealed, but the taxing power of Parliament was reiterated. This episode was one of the immediate causes of the war of the American Revolution.

STANDARD OIL COMPANY, a combination of American companies formed for the purpose of controlling the petroleum industry. Before its dissolution in 1911 by the United States Supreme Court, it was considered the most powerful industrial organization in the world. In 1909 suit was brought in the United States Circuit Court at Saint Louis for the dissolution of the company, on the ground that it was a combination in restraint of trade, and that its existence was in violation of the Sherman Anti-Trust law (see TRUSTS). The court ordered the company dissolved within thirty days, but the case was appealed to the Supreme Court, and a final decision was not reached until 1911, when the Supreme Court affirmed the decision of the lower court, but gave the company six months to adjust its affairs.

At the time of this decision the Standard Oil Company of New Jersey, as it was legally known, controlled about seventy oil companies. The dissolution did not discontinue the Standard Oil Company; it compelled this company to release its control over the other companies, and this was accomplished by relinquishing its ownership of the stocks of these companies to the former stockholders. However, since the holders of the majority of the stock in these companies were the men who controlled the Standard Oil



STANDARD TIME CHART FOR CANADA
Showing boundaries and differences in time.

Company, the dissolution had but little effect upon the methods employed in carrying on the various branches of the petroleum industry.

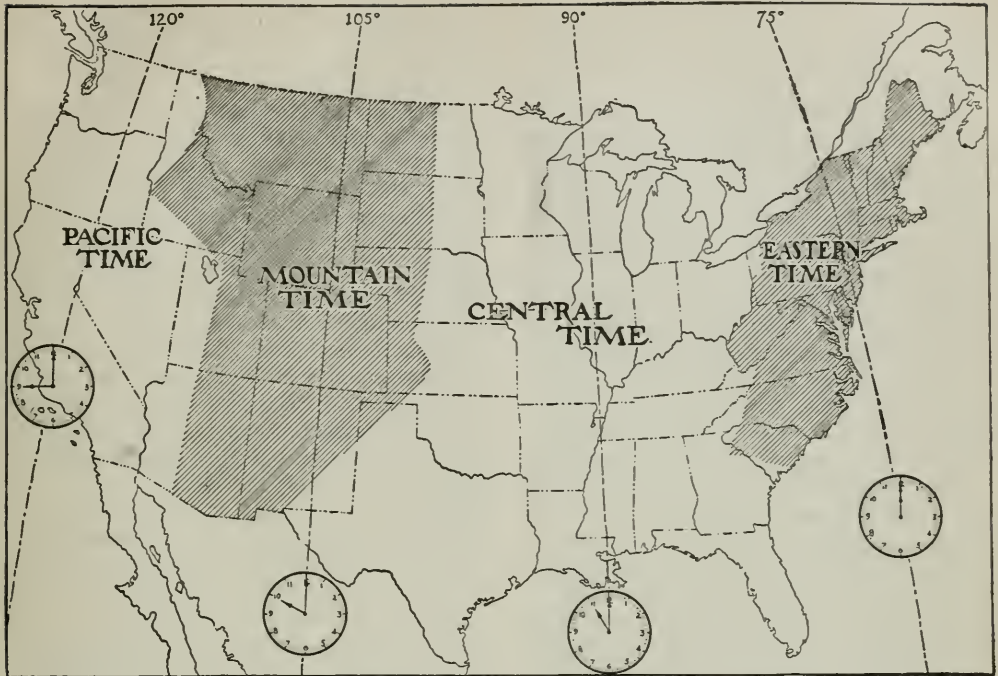
The Standard Oil Company was the outgrowth of organizations and methods originated and perfected by John D. Rockefeller and his associates in the petroleum industry. The first steps leading to it were taken in 1867, soon after the industry began to assume large proportions.

STANDARDS, UNITED STATES NATIONAL BUREAU OF, a bureau of the Department of Commerce of the United States government, which has custody of the national standards of weights and measures. The Bureau of Standards was organized in 1901, to take the place of the Office of Standard Weights and Measures. It is in charge of a director, who employs such assistants as the work of the Bureau may require. The law establishing the Bureau requires the director to compare the national standards of weights and measures with those used in commerce, engineering, scientific investigations and educational institutions, and in the construction or reproduction of these standards, or their multiples and subdivisions, and to determine the material best suited for such standards. The material selected should be such that will

not change its dimensions with a change of temperature, will not absorb moisture, and will not rust, since changes produced by any of these agencies impair the value of the standard.

The national standards of length and mass are kept in a fireproof vault in the building of the Bureau at Washington. They consist of two platinum-iridium meter bars and two standard kilograms of the same material, and were made in France.

The Bureau is organized into the divisions of Weights and Measures, Heat and Thermometry, Electricity, Optics, Structural Engineering and Miscellaneous Materials, Engineering Research and Metallurgy. The staff includes about 150 members, and their services are in constant demand, since the Bureau must test the measuring devices for the various departments of the government and their bureaus and make investigations where ordinary commercial testing facilities are lacking. It is required to prepare official specifications for much of the material purchased by the government and to test the material when purchased. It issues a number of publications of high scientific value, issues bulletins, and maintains a special laboratory at Pittsburgh for testing structural materials.



STANDARD TIME CHART FOR THE UNITED STATES
Showing boundaries and differences in time.

STANDARD TIME, the system of time-reckoning adopted by law or by general usage over a certain region. The turning of the earth on its axis from west to east causes a constant difference in sun time between places at different meridians; when it is noon at one place, it is afternoon at places to the east of that point, and forenoon at places farther west. This fact gives rise to many complications, especially in the operation of railroads, so for convenience an arbitrary system of time-reckoning is necessary.

In the United States. Previous to 1883 travelers were greatly inconvenienced by reason of the fact that every great railroad was run on a time system which might differ from that employed by any other railroad. For instance, a line of road from New York to Chicago would have to have all the watches of its employes set exactly alike. This made it impossible that over the entire thousand miles of line each employe could keep his watch regulated by local time. The road might declare that it would run its trains by New York time, which is about forty minutes faster than Chicago time. All employes' watches, then, along the entire line of road had to constantly register New York time,

regardless of the location of the employe. Another railroad running from Chicago to Denver might adopt Chicago time as its standard, or might choose to run on Denver time; or, if so determining, could select Omaha time, as that city is nearly midway between the two terminals.

Such conditions on all railroads could result in nothing short of confusion. A traveler might reach Denver from the east at 6 P. M., according to the schedule of the railroad on which he was riding. He might desire to go farther west than Denver, and would find that the train he wished to take left that city at 5:30 P. M. In the absence of a common standard of time adopted by these two railroads, this traveler would not know whether the departing 5:30 train left Denver at 5:30 by the time of the first railroad, or whether 5:30 meant a half-hour or an hour earlier or later than the time on which the first road was run.

This condition of things led to a conference in 1882 and resulted in the adoption through the United States and Canada of what is known as *standard time*. The first and most easterly division is termed Atlantic standard time, and embraces that territory which lies

$7\frac{1}{2}^{\circ}$ each side of the 60th degree of longitude. The standard time for the entire territory embraced within its limits is the local, or sun, time of Halifax.

The next division toward the West is embraced within the section called Eastern standard time, the 75th meridian being almost in its center; the time throughout the Eastern section is that of the 75th meridian, which is practically the local time of the city of Washington.

The next division toward the West embraces the great valley of the Mississippi, and here is the division of Central standard time; the meridian running nearly through the center of the Central territory is the 90th. The official time in the Central division is therefore practically the local time of the city of St. Louis, and is one hour earlier than the time in the Eastern division.

The next group of states to the West are joined in what is known as Mountain standard time, and the central portion is on the meridian of 105° , which is the location of the city of Denver. Therefore Denver local time is the standard time for the Mountain division; it is one hour earlier than Central time, and two hours earlier than Eastern.

Beyond the Mountain division is the final group of states, wherein Pacific standard time prevails; the meridian of longitude which establishes time for the Pacific division is the 120th. This is very close to Carson City, Nevada. Throughout this division the time is one hour earlier than in the Mountain division.

Railroads having adopted for all their purposes the standard time of the sections through which they run, citizens, in their business enterprises, have very largely fallen into line, and local or sun time is scarcely taken into consideration. For years after the adoption of standard time rural communities refused to change their watches and clocks, and therefore a double system of time prevailed. It took many people a long time to realize how easy it would be to turn their watches and clocks forward or backward the required number of minutes to harmonize them with the standard time of their section and then forget that such action was taken. Wherever this has been done, absolutely no change whatever has been necessary in manner of living or conduct of any enterprise.

In Canada. Canada is divided into zones of 15 degrees, extending $7\frac{1}{2}$ degrees on each

side of the central meridians, and the central local mean time is used for all places within that zone. Thus the first and most easterly Canadian division, known as Atlantic time, includes the territory which lies $7\frac{1}{2}$ degrees each side of the sixtieth degree of longitude. The standard time for the entire zone is the local or sun time of Halifax (four hours behind Greenwich time). Largely through the efforts of Sir Sandford Fleming, between the years of 1876 and 1881 the adoption of this plan was kept before the public and the government, with the result that since 1883, when a General Time Convention was held in Chicago, standard time has been in use on all railroads in North America. Besides the Atlantic zone, there are four other divisions of time in Canada which correspond with those of the United States.

The time throughout the Eastern section is practically the sun time of Ottawa. The official time in the Central division is practically the local time of the city of Port Arthur and is one hour earlier than the time in the Eastern division. Regina local time is standard time for the Mountain division; it is one hour earlier than Central, two hours earlier than Eastern and three hours earlier than Atlantic time.

Beyond the Mountain division is the last section, in which Pacific or Coast time prevails; the meridian of longitude which establishes time for this division is the 120th. The northern part of the boundary between Alberta and British Columbia runs on this meridian, but as there is no large city exactly on the line, Vancouver, $123^{\circ} 5' W.$, is made the division point on the railroad. Throughout this division the time is one hour earlier than Mountain time and eight hours earlier than Greenwich time.

The system of counting time by twenty-four hours instead of twelve is in use on all the Canadian railways west of Lake Superior and also on the Intercolonial Railway between Halifax and Montreal. Thus, twenty o'clock is eight o'clock at night, midnight being the beginning and end of each twenty-four hour period. The twenty-four hour notation is part of the scheme of time reckoning worked out by Sir Sandford Fleming.

STANDISH, MILES (1584-1656), an American colonist and soldier, born in Lancashire, England. He served in the English army in the Netherlands, and, though not a member of the Leyden congregation,

sailed with the *Mayflower* colony to Massachusetts in 1620. He became the strongest leader of the Pilgrims in their struggle against the Indians. During the first winter his wife died, and the traditional account of his effort to secure a second wife has been made familiar by Longfellow in *The Courtship of Miles Standish* (which see). In 1625 he was sent on a mission to England, but returned in the following year and settled at Duxbury, Mass., where he died. Standish was the military head of the colony, and for a long time was its treasurer. A monument surmounted by a statue has been erected to his memory at Duxbury.

STANFORD, LELAND (1824-1893), an American capitalist and philanthropist, born in Watervliet, N. Y. He studied law, moved to Port Washington, Wis., and practiced his profession there for three years. In 1852 he went to California as a mining prospector, and after four years established the mercantile business which was the foundation of his subsequent fortune of \$50,000,000. He was one of the promoters of the Central Pacific Railway. In 1861 he was elected governor of California, and from 1885 to 1891 served as United States Senator from California. He will be remembered chiefly as the founder of Leland Stanford Junior University, a memorial to his son who died in Rome at the age of sixteen. See **LELAND STANFORD JUNIOR UNIVERSITY**.

STANLEY, HENRY MORTON, Sir (1841-1904), an African explorer, born at Denbigh, Wales. His father, John Rowlands, died when the boy was but two years old. In 1857 he shipped as cabin boy to New Orleans and was there adopted by a merchant, whose name he assumed. Stanley enlisted in the Confederate army, and was taken prisoner in the Battle of Shiloh. He escaped, and after a visit to his home in Wales he volunteered into the United States navy and became an ensign on the ironclad *Ticonderoga*. At the close of the war he went West as a newspaper correspondent, and as correspondent for



HENRY MORTON
STANLEY

the New York *Herald* he joined the Abyssinian expedition of 1868. He afterward traveled in Spain, and it was while there in 1869 that he was commissioned by the proprietor of the New York *Herald* "to go and find Livingstone." After visiting the Crimea, Palestine, Persia and India, he reached Zanzibar in the early part of 1871, and thence he proceeded across Africa, in search of Livingstone (see **LIVINGSTONE, DAVID**). He met and relieved Livingstone at Lake Tanganyika in November of the same year and returned to England. He then acted as the *Herald's* correspondent during the Ashanti War.

As correspondent of the London *Daily Telegraph* and the New York *Herald*, in 1874 he undertook an expedition into Africa, where he explored the equatorial lake region, and traced the Kongo River from the interior to its mouth. For the purpose of developing this vast region he returned in 1879 under the auspices of the International African Association, founded by the king of the Belgians. In this territory stations were planted, steam navigation was established and in 1885 the territory received the name of the Congo Free State. In 1887 Stanley organized an expedition for the relief of Emin Pasha. This time he entered Africa on the west by way of the Kongo; and after a series of extraordinary marches through the forest region, he met Emin Pasha in the neighborhood of Albert Nyanza, and brought the pasha and his followers to the coast. Upon his return to England, in 1895, he became very popular. Having three years previously become a naturalized citizen of Great Britain, he was elected to Parliament and worked earnestly for the development of British interests in Africa. He wrote *How I Found Livingstone, Through the Dark Continent, In Darkest Africa* and *My Dark Companions*. Next to Livingstone, Stanley was the greatest of African explorers.

STANVOI, stahn o voi', MOUNTAINS, a range of low mountains in Northeastern Asia, extending from the Mongolian frontier to East Cape, on Bering Strait. A spur traverses the peninsula of Kamchatka. The length of the chain is 3,000 miles. Although the highest point, Mount Tehokhondo, is 8,000 feet, the average elevation is not great, the configuration being more in the nature of an elevated plateau. North of parallel 60° the lower slopes are densely wooded; south of this the summits are bare. The

range is rich in minerals, which as yet are little developed.

STANTON, EDWIN McMASTERS (1814-1869), the great American Secretary of War during Lincoln's administration. He was born at Steubenville, Ohio, attended Kenyon College, studied law and was admitted to the bar in 1836. In

1856 he opened a law office at Washington, D. C., where he acquired a large practice before the Supreme Court. He became attorney-general in 1860. Shortly after the outbreak of hostilities between the North and South, President Lincoln ap-

pointed him head of the War Department, and his acceptance of the office marked the beginning of a vigorous military policy. After Lincoln's death he remained in the Cabinet, but soon came into conflict with President Johnson over the latter's reconstruction policy. Johnson's effort to remove the Secretary brought about his impeachment. When the President was acquitted Stanton resigned. He was appointed an Associate Justice of the Supreme Court by President Grant, but died a few days after the appointment was announced.

STANTON, ELIZABETH CADY (1815-1902), a woman suffragist and reform advocate, born in Johnstown, N. Y. She was educated in the local academy and by private teachers. Her father was an eminent lawyer and a member of Congress. The daughter inherited a legal mind and strong reasoning powers. She married Henry B. Stanton, a prominent Abolitionist and a man in full sympathy with her ideas. She met Lucretia Mott while attending the World's Anti-Slavery Convention in London, and thereafter the two labored together in the cause of woman's rights.



EDWIN M. STANTON



ELIZABETH CADY STANTON

In 1848 Mrs. Stanton called the first woman's rights convention ever held in America, to assemble at her home in Seneca Falls, N. Y. Three years later she became associated with Susan B. Anthony, and they worked jointly in the cause of woman's rights for the remainder of Mrs. Stanton's life.

Mrs. Stanton had a charming personal appearance, and was a good writer and a fluent speaker. She attained a national reputation as an author and lecturer and exerted a strong influence in behalf of the cause which she advocated. She held many prominent positions in women's organizations and was active in securing higher education for women. Some of her best-known writings are *The Solitude of Self*, *Self-Government the Best Means of Self-Development*, *Eighty Years and More*, an autobiography, and *A History of Woman Suffrage*.

STANTON, FRANK LEBBY (1857-), an American poet and journalist, born at Charleston, S. C. He had a common school education, was apprenticed to a printer and early entered the field of journalism. He was one of the first poet humorists to edit a column of witty comment and satiric criticism of current events. His column "News from Billville," in the *Atlanta Constitution*, brought him wide notice and popularity, and his negro dialect verse added to his fame. His poetry appeals by reason of its simplicity and optimistic tone. His books are *Songs of the Soil*, *Songs from Dixie*, *Up from Georgia* and *Little Folks down South*.

STARCH, a white, odorless, tasteless compound found in all plants except fungi. Chemically it is known as a carbohydrate, or compound of carbon, oxygen and hydrogen. It constitutes one of man's chief foods, and is an important heat and energy producer. The processes by which starch is produced in a plant are not known to the botanist or the chemist. It is sometimes stored in the leaves, but is more plentiful in thick roots, tubers and seeds. It abounds in arrowroot, potatoes and wheat.

Starch is a soft, white powder. Microscopic examination shows that it consists of tiny grains, varying in size and formation according to the plant, the grains of potato starch being among the largest, those of wheat and rice among the smallest. It will not dissolve in cold water, alcohol or ether; but if boiled in water it forms a paste.

Starch when subjected to dry heat changes to dextrin, and from this is derived, through fermentation, the substance known as dextrose, or grape sugar.

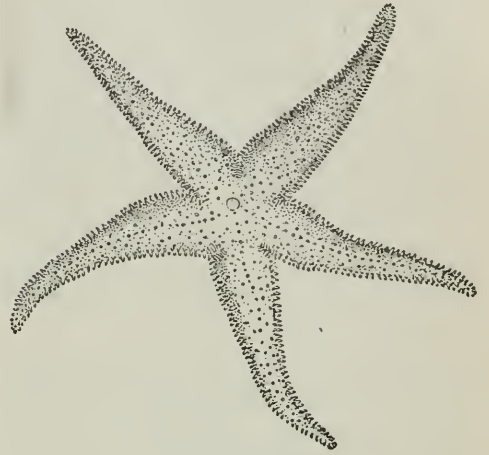
Starch is used for food and for various industrial purposes. Its chief use in industry is as a stiffening for clothes in the laundry. That used for industrial purposes is obtained from rice, potatoes, wheat and sago. Rice starch, which is preferred for laundry purposes, is prepared by steeping the grains in an alkaline solution. Potato starch is obtained by merely steeping the potatoes, mashing them to a pulp, and after they have remained for a time in a settling tank, drying with gentle heat. To separate the starch from wheat the grains are fermented, the gluten dissolves, and in the washing process which follows the gluten and starch are separated. In addition to its use in laundries, starch is employed in the manufacture of dextrin; it is also used as a thickener in calico printing and for numerous miscellaneous purposes.

The value of the starch annually manufactured in the United States is more than \$9,000,000. Most of it is made from Indian corn, which of all known plants contains the highest percentage of starch (77%). Rice contains 76% starch, wheat 54.75%, and potatoes 18.5%.

STAR CHAMBER, formerly an English court of civil and criminal jurisdiction at Westminster, said to have taken its name from the star-decorated room in which it was held. Originally a committee of the Privy Council, it was remodeled during the reign of Henry VII to include four high officers of state, with power to add to their number a bishop, a temporary lord of the council and two justices of the courts of Westminster. It had jurisdiction over forgery, perjury, riots, maintenance, fraud, libel and conspiracy cases, and it could inflict any punishment short of death. Its trials were without jury, and the abuses which this made possible led to the abolition of the court in the reign of Charles I. To-day any secret meeting to deliberate on public matters is called a *star-chamber* session.

STARFISH, an interesting sea animal shaped much like a five-pointed star, belonging to the group of marine animals known as *echinoderms*, meaning *spiny-skinned*. The fish consists of a central disk from which radiate five arms, and the entire body

is encased in a tough skin covered with tiny spines. In the center of the under surface of the disk is a mouth, and from this pass



STARFISH

five grooves, each leading to the tip of one of the points. There is a small eye at the tip of each arm. Double rows of tiny suction cups along these grooves serve for purposes of locomotion and for organs of smell. They also serve the animal in capturing its prey—oysters, mussels, snails and other mollusks. By these means the starfish can pull upon an oyster shell with such force that the valves break open. Its raids upon some of the oyster beds of the Atlantic coast cause an annual loss of many thousands of dollars.

STARK, JOHN (1728-1822), an American soldier, born at Londonderry, N. H. While still a young boy, he was captured by the Saint Francis Indians and adopted into the tribe. He fought in the last French and Indian war, and at the opening of the Revolution he raised a regiment, which he led to Cambridge, and took a prominent part in the Battle of Bunker Hill. He was present with Washington at the battles of Trenton and Princeton, but resigned his commission in April, 1777. At the approach of Burgoyne, however, in the fall of the same year, he raised a regiment of New Hampshire troops and completely routed a force of Tories and Hessians at Bennington, August 16. He was also present at the Battles of Saratoga and was made a brigadier-general in 1777. Stark was a member of the André court-martial and served at the head of important departments until the close of the war. He was one of those who, in 1776,

pledged their private fortunes to pay the soldiers, in order to induce them to enlist for a second term.

STARLING, a European bird related to the blackbird. It has a short tail, long and pointed wings and a sharp bill. The plumage the first year is brown; afterwards it is blackish, with a greenish luster, occasionally purplish. The shoulders are brown, and the wing coverts have light edges. The females are more soberly colored. Starling nests are placed in ruined walls or in the branches, and five pale blue eggs are laid. The birds feed upon insects, and are often found near domestic animals catching the insects that the latter attract.

Starlings have a variety of notes, and some species have clear whistles or rich songs. They thrive in captivity and improve in their songs. The common starling was introduced into the United States in 1890, and the birds are now numerous in the Eastern states.

STAR-NOSED MOLE, a North American genus of moles, distinguished by bearing at the extremity of the muzzle a remarkable structure of fleshy and somewhat cartilaginous rays, disposed in the form of a star.

STAR OF BETHLEHEM, a common spring garden plant of the lily family, with white, waxy and starlike flowers. It is a native of Europe, but it is naturalized in the United States.

STAR ROUTE, a route in the United States over which mail is transported in bulk by private contract after it leaves a railway train or a steamboat. Such routes are called star routes because they are marked in postal guides by asterisks. The mail may be carried in a wagon, on horseback, or by a messenger on foot. Mail routes by railroads, or steamboats and rural free delivery routes are not star routes.

Star Route Frauds, frauds disclosed in connection with the postal service during the administration of President Hayes. Through the activity of a certain clique of government officers, including several Senators and Representatives, the compensation for carrying the mails over these routes was increased more than fourfold, the profits being divided between the contractors who carried the mail and the members of the ring. The leaders were prosecuted during the early part of Garfield's administration, but only one was ever punished. However, the operations of the conspirators were ended.



STARS. "One sun by day, by night ten thousand shine," wrote the poet Young, in *Night Thoughts*, in reference to the stars. These heavenly bodies are suns like the one which warms and lights the earth, but they are so far away that they appear in the sky merely as twinkling spots of light. Because they seem

to remain immovable they are often called *fixed stars*, but the name is not appropriate, for it is now known that all are in motion. The movements of some have been ascertained by astronomers, but they are at such infinite distances from the earth that to the naked eye they do not appear to change their relative positions. In order to distinguish the stars from one another the ancients divided the heavens into spaces containing groups of stars called constellations, but modern astronomers have divided the heavens by imaginary circles which correspond to the circles measuring longitude and latitude on the earth.

Magnitudes of Stars. The stars are classified according to their brightness as of different magnitudes, those of the first magnitude being the brightest. All the stars beyond the sixth or seven magnitude are called *telescopic stars*, as they cannot be seen by the naked eye. Astronomers recognize stars as small as those of the sixteenth magnitude. As to the absolute size of the stars, little is known; but the light given out by Sirius, the brightest star in the heavens, is estimated at 63½ times that of the sun. Stars are very irregularly distributed over the heavens; in some regions scarcely one is to be seen, while in others they seem densely crowded together, especially in the portion known as the galaxy, or Milky Way. Of the stars visible to the naked eye at one time, the number probably does not exceed a few thousands, but seen through the telescope, their number is so great as to defy calculation.

Distances of the Stars. The distances of the stars from the earth are very great. The shortest distance yet found, that of *α Centauri*, a double star in the Southern Hemisphere, has been calculated at 20,000,000,000 miles, so that light takes 3½ years to travel from it to our earth and a flash of light will encircle the earth in less time than one can

wink. When we look at the stars, they appear to be placed on the inside of a hollow sphere that revolves around us, and the pivot on which the sphere turns is near the North, or Polar, Star. This apparent rising and setting of the stars is due to the rotation of the earth.

Variable Stars. Many stars have been observed whose light appears to undergo a regular periodic increase and diminution of brightness, amounting, in some instances, to a complete extinction and revival. These are called *variable* and *periodic* stars. It is found that some stars, formerly distinguished by their splendor, have entirely disappeared. Such stars are called *temporary*. Many of the stars that usually appear single are found, when observed with telescopes of high magnifying power, to be really composed of two, and some of them have three or more stars close together. The colors of the stars vary considerably, red, yellow, blue and green being noticeable, and it is supposed that they differ considerably in composition, though they are probably made up of the same matter that composes the earth.

Related Articles. For names of the stars treated in these volumes, see the list accompanying the article Astronomy. For further information, consult the following titles:

Constellations	Milky Way	Solar System
Double Stars	Planet	Sun

STAR-SPANGLED BANNER, the most popular patriotic hymn of the American people, and by common acceptance the one honored as their national anthem. The words were written by Francis Scott Key in 1814, during the War of 1812, under the following circumstances: After the burning of the national capital by the British, an American official was taken captive on board the British frigate *Surprise*, stationed in Chesapeake Bay. Francis Scott Key and a friend boarded the ship in an attempt to secure the release of the prisoner, and found the frigate being prepared to bombard Fort Mchenry, a fortress near Baltimore, Md. Forced to remain on board until after the battle, the Americans watched the bombardment throughout the day (September 13) and the ensuing night, and when in the morning they saw, through a rift in the haze and smoke, the Stars and Stripes still waving over the fort, Scott was inspired to write the words of his immortal song. The music is that of an old English tune called *Anacreon in Heaven*.

Below are the first, second and fourth stanzas of the anthem (the third being omitted):

Oh! say, can you see, by the dawn's early light,
What so proudly we hailed at the twilight's
last gleaming?

Whose broad stripes and bright stars, thro'
the perilous fight,
O'er the ramparts we watched were so gal-
lantly streaming?

And the rockets' red glare, the bombs bursting
in air,

Gave proof thro' the night that our flag was
still there.

Oh! say, does the star-spangled banner still
wave

O'er the land of the free and the home of the
brave?

On the shore, dimly seen thro' the mist of
the deep.

Where the foe's haughty host in dread
silence reposes,

What is that which the breeze, o'er the
towering steep,

As it fitfully blows, half conceals, half dis-
closes?

Now it catches the gleam of the morning's
first beam,

In full glory reflected, now shines on the
stream;

'Tis the star-spangled banner. Oh! long may
it wave

O'er the land of the free and the home of the
brave!

Oh! thus be it ever when freemen shall stand
Between their loved homes and the war's
desolation;

Blest with vict'ry and peace, may the
heav'n-rescued land

Praise the Pow'r that hath made and pre-
served us as a nation.

Then, conquer we must, when our cause it is
just,

And this be our motto, "In God is our trust."
And the star-spangled banner in triumph
shall wave

O'er the land of the free and the home of the
brave.

STARVATION, *stahr va'shun*. When food is not taken in sufficient quantities to supply the waste that is continually taking place in the various organs of the body, the tissues themselves are used to supply energy, and starvation follows. The accompanying conditions are emaciation, lowered vitality and temperature and a general weakness. Death in animals, according to Chossat, occurs when the body has lost two-fifths of its weight. Man seldom lives longer than a week or ten days when deprived of food, but he may live much longer if he lies quietly in bed and keeps warm. An Italian named Succi, and

an American, Dr. Tanner, each tried the experiment of fasting forty days without food but with a little water, and lived through the ordeal. Others have tried like experiments in the interests of medical science and have died from their effects.

STATE, an organization of people for political ends, permanently occupying a fixed territory, and possessing an organized government capable of making and enforcing law within the community. To be a sovereign state, such an organization cannot be subject to any external control. In the United States the term *state* is also applied to the political divisions which are united under the Federal government. As to its form of government a state may be an aristocracy, a monarchy or a democracy. Since the beginning of the twentieth century democracy has gained at the expense of other forms of government. This statement is entitled to still greater emphasis since the close of the World War, in 1918.

A study of the state is a study of the philosophy of politics from the time of the ancient Greeks to the present day, and even an outline of such a study would be impossible in a brief article. It is generally conceded, however, that the functions or purposes of the state are to develop the moral nature of its subjects; to preserve order; to further the general welfare, and to defend its people from external attacks.

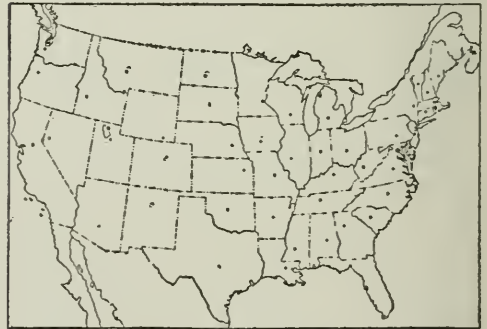
Two theories of the state are strongly set forth by their respective followers. The first is that of the *paternalistic* or *socialistic* state, in which the government confines itself to the fundamental functions of preserving peace and punishing crime. There is a happy middle ground in which the state exercises those functions which have for their purpose the greatest good to the greatest number, and leaves to the individual citizen the freedom necessary to the enjoyment of life and the pursuit of happiness. See GOVERNMENT.

A State in the United States. When the pupil begins the study of the state as a unit in political geography he should have set before him the reasons for the division of the whole country into relatively small areas, each subdivided portion a state.

The thousands upon thousands of square miles of the national domain could not be governed properly from one point, no matter if it were centrally located. The national

capital was placed at the extreme eastern part of the country; except for inconvenience in traveling to it there can be no objection to its present location, in view of the divisions that have been made for purposes of local government. Were one capital city the source of all authority and were the American people governed exclusively from it, one might justly believe that sections near at hand would be well governed, and that within such area the interests of every person would be protected, while regions far distant would suffer for lack of properly exercised control.

When the pupil begins the study of civil government he will learn that for most purposes of government—for all purposes purely local—the state does not recognize the national government as a higher authority. In such matters as only concern the people in their relation to the state the authority of the state is supreme. The national government controls affairs within the state only so far as the welfare of all of the people of all of the states is concerned. The chart below shows the locations of many capital cities,



CAPITAL CITIES

Each star locates the seat of a nearly independent government.

each the absolute center of authority in all matters pertaining to the every-day needs of the people within that state. The controlling power is thus always near to all the people; that this necessary condition might prevail the state boundaries were located and state governments were organized.

It is well to study the geography of a state systematically and to cover every essential feature. Such a determination will lead older students to add to the merely geographical outlines something of government and history. In following the accompanying outline, such parts may be omitted for younger children as may seem justifiable:

Outline for Study of a State

- I. LOCATION
 - (a) Latitude
 - (b) Longitude
 - (c) Boundaries
 - (b) Navigable rivers
 - (c) Commercial centers
 - (1) Ten largest cities in order
 - (2) Population of each
 - (3) Distances from other great cities
- II. EXTENT
 - (a) Length
 - (b) Breadth
 - (c) Area
 - (d) Compare in size with other states and countries
- III. OUTLINE
 - (a) General form
 - (b) Boundaries
 - (c) If there is coast line
 - (1) Length
 - (2) Indentations
 - (3) Projections
- IV. SURFACE
 - (a) General facts
 - (1) Mountains or great hills
 - (2) Plains
 - (3) Valleys
 - (4) Watersheds
 - (b) Effects on climate
- V. DRAINAGE
 - (a) River systems
 - (b) Lakes and streams
- VI. CLIMATE
 - (a) Natural condition expected, due to latitude
 - (b) Changes wrought by physical features
 - (c) Effect on health
 - (d) Average annual rainfall
- VII. PRODUCTS
 - (a) Agricultural
 - (1) Grains
 - (2) Stock raising
 - (3) Dairying, etc.
 - (4) Fruits, etc.
 - (5) Rank among states in production
 - (b) Mineral
 - (1) Precious metals
 - (2) Iron, coal, copper, etc.
 - (3) Oil and gas
 - (4) Sections where found
 - (5) Rank among states
- VIII. COMMERCE AND INDUSTRY
 - (a) Railways and canals
- IX. POPULATION
 - (a) Rate of increase
 - (b) Per cent of native Americans
 - (c) Countries furnishing foreign-born peoples
 - (d) Where densest, and why
- X. GOVERNMENT
 - (a) State departments
 - (1) Executive
 - (2) Legislative
 - (3) Judicial
 - (4) How officers are chosen
 - (5) Length of terms
 - (b) Number of counties
 - (c) Number of members in Congress
 - (d) State institutions
 - (1) Penal
 - (2) Charitable
 - (3) Education of defectives
 - (4) How each is conducted
- XI. EDUCATION
 - (a) Public school system
 - (1) Common schools
 - (2) High schools
 - (3) Normal schools
 - (4) Industrial education
 - (a) School of Mines
 - (b) Agricultural College
 - (5) State University
 - (b) Colleges
 - (c) Large private schools
- XII. HISTORY
 - (a) Exploration and settlement
 - (b) Date made a territory
 - (c) When admitted to Union
 - (d) Events that are historical
 - (e) Famous men and women
- XIII. STATISTICAL
 - (a) Rank among states in mineral products
 - (b) Rank in farm products
 - (c) Rank in area
 - (d) Rank in population

. **STATE BANKS.** See **BANKS**, subhead *State Banks*.

STATE, DEPARTMENT OF, one of the ten executive departments of the United States government, in charge of the Secretary of State, appointed by the President and confirmed by the Senate. This department was the first one organized under the Federal government. The Secretary is first in importance and prestige in the President's Cabinet and is first in line of succession to the Presidency. The department has charge of all foreign affairs, both of state and of the consular service, and its business is transacted through various bureaus and divisions. The duties of the Secretary of State follow:

The Secretary of State is charged, under the direction of the President, with the duties appertaining to correspondence with the public ministers and the consuls of the United States, and with the representatives of foreign powers accredited to the United States; and to negotiations of whatever character relating to the foreign affairs of the United States. He is also the medium of correspondence between the President and the governors of the several states of the United States; he has the custody of the Great Seal of the United States, and countersigns and affixes such seal to all executive proclamations, to various commissions and to warrants for the extradition of fugitives from justice. He is also the custodian of treaties made with foreign states, and of the laws of the United States. He grants and issues passports, and exequaturs to foreign consuls in the United States are issued through his office. He publishes the laws and resolutions of Congress, amendments to the Constitution, and proclamations declaring the admission of new states into the Union.

STATEN ISLAND, an island forming a portion of the southeastern part of New York State and the southern part of Greater New York, of which it constitutes the borough of Richmond. It is situated at the entrance of New York harbor, five miles southwest of Manhattan Island, and is separated from Long Island by the Narrows and from New Jersey by Staten Island Sound. It contains many fine residences. The island is thirteen miles long and has a hilly surface, the highest elevation being about 300 feet. The principal villages are New Brighton, New West Brighton, Port Richmond, Stapleton and Tompkinsville.

STATES-GENERAL, a French legislative body which existed from 1302 until the time of the French Revolution. It was made up of members of the clergy, the nobility and representatives of the common people, or Third Estate. These last were in the beginning elected by the king, but after 1484 all members were chosen by vote. The States-General met only when called by the king in times of emergency. From 1614 the body was not assembled until the famous meeting of 1789 (see **FRENCH REVOLUTION**).

The name States-General is also applied to the legislative assembly of Holland.

STATES OF THE CHURCH. See **PAPAL STATES**.

STATES' RIGHTS, a term employed in political science to denote the governmental rights of the individual states belonging to a Federal Union, it being understood that there are certain matters in which the states may act without interference from the central government. History proves that in a federation of independent states freedom of action is tolerated only so long as it does not interfere with the interests of the Union. The evolution of states' rights in the United States is a typical example. In the time of Hamilton it was a debatable issue; and Jefferson's contention that the right of each state to control its affairs was paramount to the central authority led logically to the doctrine of the right of secession. The Civil War removed all claims of state sovereignty.

STATICS, that branch of dynamics which treats of the properties and relations of forces in equilibrium, equilibrium meaning that the forces are in perfect balance, so that the body upon which they act is in a state of rest. The word *dynamics* is employed as expressing the science which treats of the laws of force or power, thus corresponding closely to the old use of the term *mechanics*; and this science is divided into *statics* and *kinetics*, the first being the science which treats of forces considered as producing rest and the second as treating of forces considered as producing motion. See **DYNAMICS**.

STATISTICS, a collection of facts; especially those facts which illustrate physical, social, moral, intellectual, political, industrial and economic conditions or changes of condition, and which admit of numerical statement and of arrangement in tables. The collection of statistics may have the object merely of ascertaining numbers or of learning what

happens in an average of a great number of cases, as is the case of insurance statistics; or of detecting the causes of phenomena that appear in the consideration of a great number of individual cases—such phenomena, for example, as the decline of a certain trade or the prevalence of a certain disease. In all civilized countries the collection of statistics forms an important part of government.

STATUARY HALL, a large room on the main floor of the Capitol at Washington, which since 1864 has been used as a memorial hall. Each state may place in it two statues of the men or women it wishes thus to honor. The hall, which is circular in shape and directly beneath the dome, was, until 1857, the chamber of the House of Representatives, and many are the important events in United States history that have taken place within its walls. Here Madison was inaugurated President in 1809 and 1813, and Monroe in 1821; here John Quincy Adams was elected President in 1825, and here Fillmore took the oath of office. Within these walls took place many important debates; the voices of Calhoun and Webster, of Lincoln and Douglas, were among those that directed events.

According to the Congressional act by which the room was created a memorial hall, the statue may be in bronze or marble and must be a portrait of a deceased person who was a citizen of the state and distinguished for civic or military service. Of the forty-one illustrious citizens who have been honored by representation in the hall only one is a woman—Frances Willard. The following is a complete list (1919), showing the representation of each state:

STATUTE, the written enactment of the legislative branch of a government or of some duly authorized body acting in conformity with its will. The supreme legislative bodies are called respectively Congress, Parliament or some synonymous name. Smaller bodies, such as councils, and boards of aldermen, acting under the authority of the higher body, may pass ordinances dealing specifically with local administration—ordinances duly sanctioned by constitutional rule.

STAUNTON, VA., the county seat of Augusta County, 135 miles northwest of Richmond, on the Baltimore & Ohio and the Chesapeake & Ohio railroads. The city is surrounded by an agricultural region, and is the center of the apple production of the state. Its factories turn out organs, overalls, pennants, brick, flour, chemicals, wagons, agricultural implements and general machine shop products. The leading public buildings are the city hall, the courthouse, the Masonic Temple and the Columbian Hall. The state institutions for the insane, the deaf and dumb and the blind are located here, and the city has several seminaries for girls, a military academy and parish and other private schools. The place was settled in 1745 by people from northern Ireland and was chartered as a city in 1871. During the Civil War it was an important strategic point. Woodrow Wilson was born in Staunton in 1856. The City Manager form of administration was adopted in 1909. Population, 1910, 10,604; in 1917, 11,823 (Federal estimate).

STEAD, *sted*, WILLIAM THOMAS (1849-1912), an English editor, born at Embleton.

STATE	NAME	DATE	STATE	NAME	DATE
Alabama	J. L. M. Curry	1906	New Jersey	Richard Stockton	1886
Connecticut	Roger Sherman	1872	"	Philip Kearny	1875
"	Jonathan Trumbull	1872	New York	Robert R. Livingston	1874
Idaho	George L. Shoup	1909	"	George Clinton	1873
Illinois	James Shields	1893	Ohio	James A. Garfield	1885
"	Frances E. Willard	1905	"	William Allen	1887
Indiana	Oliver P. Morton	1899	Pennsylvania	J. P. G. Muhlenberg	1881
"	Lew Wallace	1909	"	Robert Fulton	1881
Iowa	James Harlan	1909	Rhode Island	Nathanael Greene	1869
Kansas	John J. Ingalls	1904	"	Roger Williams	1870
Maine	William King	1877	South Carolina	John C. Calhoun	1909
Maryland	Charles Carroll	1901	Texas	Stephen F. Austin	1904
"	John Hanson	1901	"	Samuel Houston	1904
Massachusetts	Samuel Adams	1873	Vermont	Ethan Allen	1875
"	John Winthrop	1872	"	Jacob Collamer	1879
Michigan	Lewis Cass	1889	Virginia	George Washington	1908
"	Zachariah Chandler	1913	"	R. E. Lee	1908
Missouri	Francis P. Blair	1899	West Virginia	John E. Kenna	1901
"	Thomas H. Benton	1899	"	Francis H. Pierpont	1903
New Hampshire	John Stark	1894	Wisconsin	James Marquette	1895
"	Daniel Webster	1894			

After nine years' experience as editor of the *Darlington Northern Echo*, he became assistant editor of the *Pall Mall Gazette* under John Morley, and when the latter retired Stead became editor. He introduced the interview and many American methods into English journalism, and made a reputation for his originality. In 1890 he founded the monthly *Review of Reviews*, with branches in Australia and the United States, and was editor of it until his death. He vigorously opposed war, and his weekly paper, *War Against War*, did much to create a sentiment for universal peace. His opposition to the Boer War cost him the friendship of Cecil Rhodes. He wrote numerous books and magazine articles, including some on spiritualism, to which he became a convert. Whatever he undertook, his unbounded enthusiasm and enterprise gave him the strength of a crusader; he always fought for what he believed. He made several visits to America, and lost his life when the *Titanic* sank off the Grand Banks of Newfoundland. His books include *The Truth About Russia*, *A Study of Depraving Democracy* and *If Christ Came to Chicago*.

STEAM. We usually think of steam as the vapor of water formed when it is at boiling point, that is, 100° C. or 212° F. However, steam forms at all temperatures, even below freezing point, for steam is the vapor of water, and is formed whenever evaporation (which see) takes place.

Steam is lighter than water, and at boiling point it occupies about seventeen hundred times as much space. Pure steam is invisible and should be distinguished from the clouds formed by the issuing of steam from the spout of a teakettle or the escape pipe of an engine, for these clouds are caused by the condensation of the steam into minute particles of water. The expansive force of steam increases with the increase of temperature. This is taken into consideration in the operating of engines. Dry steam is secured by heating steam to a temperature above that of boiling water. The dome of the boiler is a chamber for collecting the dry steam. *Wet steam*, or *saturated steam*, is of the temperature of boiling water and contains particles of water suspended in the vapor. *Waste*, or *exhaust steam*, is that which has been used; *live steam* is that ready for use.

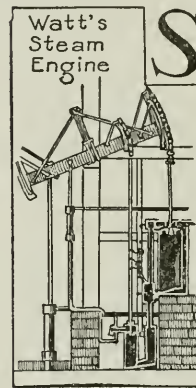
The great expansive force of steam, and the ease with which it can be condensed, make it

the most valuable gas for the motive power of engines. Steam is also used for warming buildings, for cooking, in meat packing and for extracting substances such as glue from animal tissues.

Related Articles. For further information on this subject consult the following titles:

Boiling Point
Evaporation

Steam Engine
Turbine



STEAM ENGINE. Every boy and girl has probably read the story of James Watt, who sat by the fire and watched the steam as it lifted the lid of his mother's teakettle, and how from these observations he worked out a device to utilize the power of steam in operating machinery. We think of Watt as the inventor of the steam engine, because

he was the first to make it a practical machine, but several others before Watt's day had attempted to invent a steam engine, and in 1705 Thomas Newcomen of England was granted a patent for an engine that was used for some time for pumping water from coal mines.

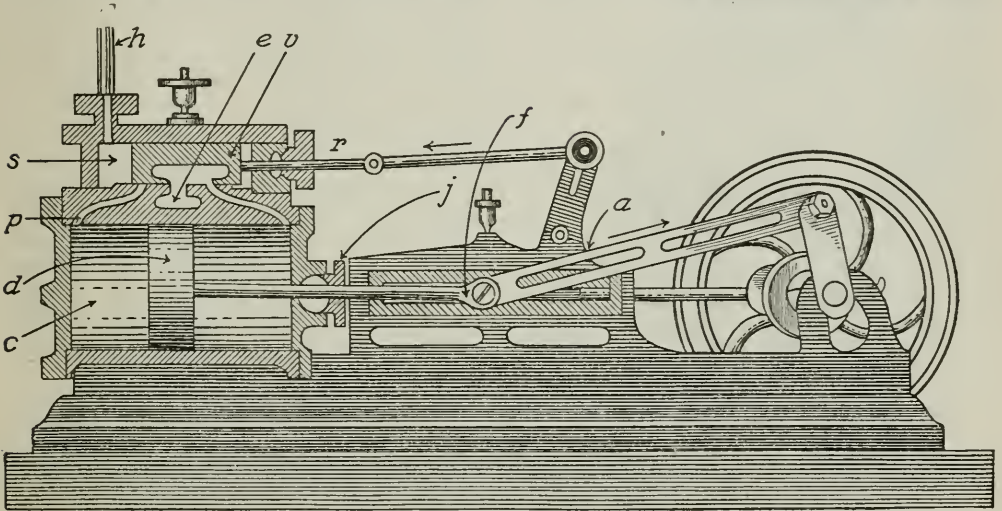
Newcomen's original engine was a clumsy device, consisting of a boiler, from which the steam was conveyed by a pipe to the interior of a cylinder, the upper end of which was open to the air, and in which the piston worked. The piston was attached to a walking beam, to the opposite end of which the pump rod was attached. Clumsy as this machine was, it worked fairly well for pumping water. The piston was raised by the pressure of steam and was forced down by the pressure of the air, after the steam in the cylinder had been condensed by the use of cold water. The valves were worked by hand until a boy who was tending the valves became tired of his task and by a system of sticks and cords so connected them with the walking beam that the engine became self-acting. Later his device was attached to all engines.

Watt's work consisted in improving Newcomen's engine. This he accomplished by constructing a cylinder that would admit steam at each end, and by attaching a valve to this cylinder so that the steam would enter one end of the cylinder as it escaped from

the other, as shown in the illustration. In Watt's engine the steam pushed the piston back, and the use of cold water for condensing the steam in the cylinder was unnecessary. Watt's improvement resulted in such a saving of fuel and increase of speed in the engine as to make it practical. He took out his first patent in 1769, and, because all steam engines constructed since have been upon Watt's plan, that is the year in which the steam engine is considered to have been invented.

Parts. The essential parts of a steam engine are the boiler; the working parts, consisting of cylinder, piston, valves and gear; the necessary appliances for connecting the piston with the machinery to be operated.

opens and closes the steam ports and the exhaust port. The diagram shows steam entering the cylinder through the left port and escaping to the exhaust port at the right. The piston is moving towards the right. When it reaches its farthest point in that direction, the valves are reversed, thus forcing the piston back to the opposite end of the cylinder. The outer end of the piston rod is connected with a *cross head*, to which the crank rod (*a*) is also attached. The cross head slides between guides and holds the piston rod firmly in position. The connecting rod joins the cross head to the crank and thus changes the reciprocating motion of the piston into the rotary motion of the shaft. The shaft contains the necessary attachments for operating



PARTS OF A STEAM ENGINE
Explanation appears in the text.

These usually consist of a connecting rod, a crank and a shaft, or fly wheel.

The cylinder is an iron box, whose inner surface has been carefully turned. Upon one side, a box called the *steam chest*, (*s*), is fastened, and from this openings, called *steam ports*, lead to each end of the cylinder (*c*). Steam is admitted through the pipe (*h*). Between the steam ports is the *exhaust port* (*e*). The *valve* (*v*) is connected by the eccentric rod (*r*) with the eccentric, which gives it its sliding motion. The cylinder contains the piston (*d*), to which is fastened the piston rod (*f*). As this leaves the cylinder it passes through the *stuffing box* (*j*), which is packed with cotton waste or other material, to make it steam-tight. The valve alternately

the valves and governor, so that the engine is automatic. All that is necessary to start the engine is to open the *throttle valve*, which admits the steam to the steam chest through the pipe (*h*). The movement is regulated by the governor.

Classification. Engines are classified according to the position of the cylinder axis, according to their method of using steam and according to the work for which the engine is designed. A vertical engine has the axis of the cylinder in a vertical position, and the piston has an up and down motion. A horizontal engine has the piston axis in a horizontal position. This is the most common pattern of stationary and locomotive engines. The use of electricity has led to the construction

of a pattern of large engine which combines the vertical and horizontal types, one cylinder being vertical and the other horizontal. Some of these engines have a capacity of 5,000 or 6,000 horse power.

According to their method of using steam, engines are *condensing*, or *low pressure*, and *non-condensing*, or *high pressure*. A condensing engine is one in which the exhaust steam is conducted to a condensing chamber, where

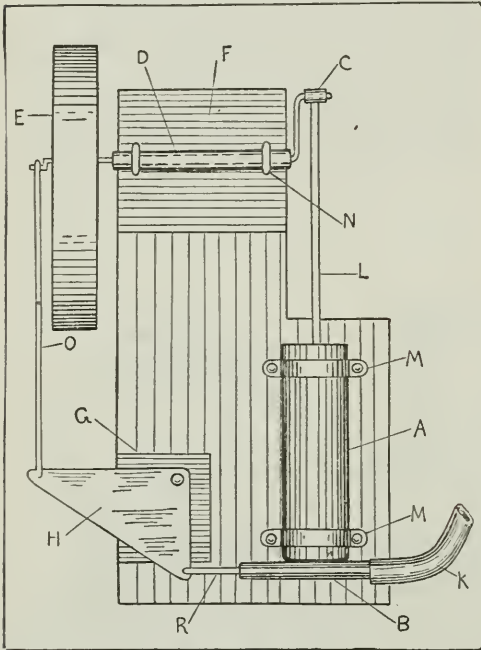
steam to escape into a vacuum. In the high pressure engine the exhaust steam escapes into the air, consequently it must overcome the pressure of air, which, at sea level, is equal to about fifteen pounds to the square inch.

The *compound* engine uses the steam successively in two or more cylinders before it is allowed to escape, while a *simple* engine uses the steam but once. Compound engines, known as *triple expansion* engines, are the most common form of marine engines. They are usually vertical and use the steam three times.

How to Make a Steam Engine. A toy or model engine can easily be made from material found in nearly every home. The cylinder A (Fig. 1) is an old bicycle pump, cut in half. The steam chest B is part of the piston tube of the same pump, the other parts of the tube being used for the bearing C and the bearing D. The fly-wheel E may be any small-sized iron wheel, such as an old sewing-machine wheel or pulley wheel. If the bore in the wheel is too large for the shaft, it may be bushed with a piece of hard wood: to bush the bore cut out a circular piece of wood to fit tightly into the opening; in this piece of wood then cut a circular hole just large enough to admit the shaft. The shaft may be made of heavy steel wire, the size of the hole in the bearing D.

The base should be of wood on which are fastened two blocks F and G, $\frac{3}{8}$ -inch thick, to support the bearing D and the valve crank H, which is made of tin. The hose K leads to the boiler. The clips M are soldered to the cylinder and nailed to the base, and the bearing D is fastened by staples.

The piston is harder to make, because it must fit closely into the cylinder and yet move freely. It may be made of a stove bolt A (Fig. 2), with two washers FF which just fit the cylinder. Around the bolt wind soft string to the width of the washers. Before winding it would be well to saturate the string with thick oil. A slot must be cut in the end of the bolt A to receive the connecting rod C. Solder or a pin as shown in the diagram may be used to hold the rod C in place. The valve D is made of an old bicycle spoke E, with the nut cut in half and the space between filled with string and oiled, just as was done with the stove bolt. Bore a hole in the bottom of the cylinder and another of equal size in the side of the piston



TOY STEAM ENGINE (Fig. 1)

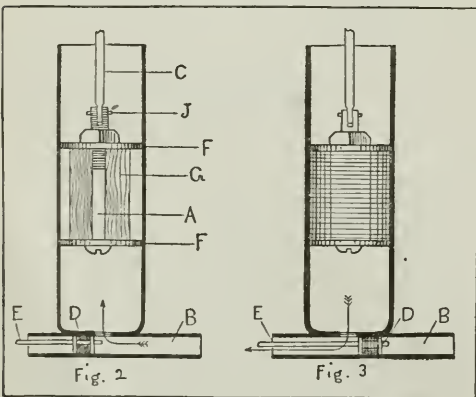


Fig. 2

Fig. 3

it is condensed, the water being returned to the boiler. This is called the low-pressure engine, because the air pump connected with the condensing chamber enables the exhaust

tube in which the valve D works. Then solder these pieces together so that the holes leave a free opening. The valve crank H (Fig. 1), already mentioned, may be cut from a sheet of heavy tin or galvanized iron, and is moved back and forth by a crank on the shaft. This crank must be at right angles to the main shaft.

The boiler may be an old oil, powder, or syrup can with a tube soldered to it. This tube should be connected to the engine by the rubber E of Fig 1. A good Bunsen burner or small gas stove will furnish enough steam to run the engine at high speed.

Now that we have set up the engine we may study the manner in which it works. The water in the boiler becomes steam when the heat underneath is sufficiently great.

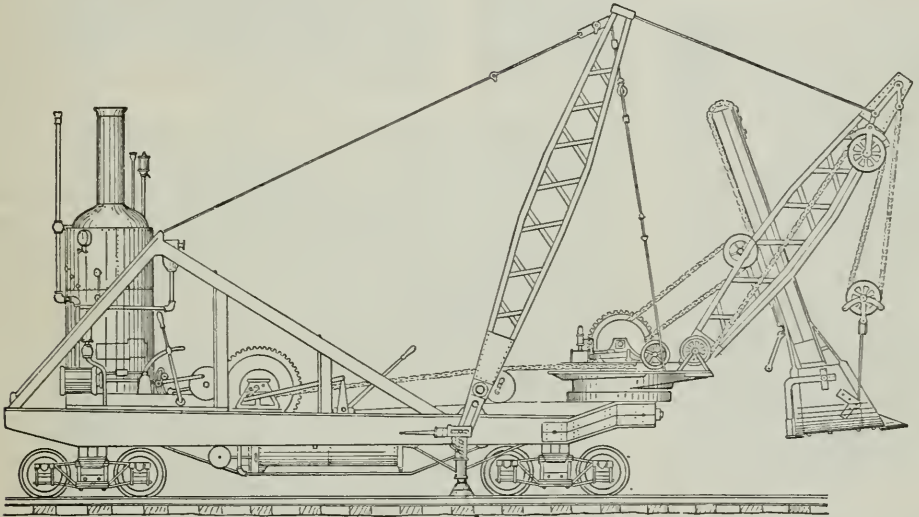
will continue. The operator should be careful that no steam escapes at the joints or connections. When the machine is in good running order it is possible to run a belt over the fly-wheel and let it perform a great variety of work for us.

Related Articles. Consult the following titles for additional information:

Boiler	Locomotive
Eccentric	Traction Engine
Governor	Watt, James

STEAM HAMMER, a hammer operated by the action of steam, without the aid of any other machinery. This contrivance was invented by an Englishman, James Nasmyth, in 1839, and it immediately revolutionized the industries involving heavy forging.

The important parts of a steam hammer are frame, cylinder, piston, piston rod, ham-



STEAM SHOVEL

Through the tube K this steam is let into the cylinder when the valve D (Fig. 2) is at the left of the opening. The pressure of the steam forces the piston upwards, thus turning the crank C and the fly-wheel E. The turn of the fly-wheel works the valve crank H which in turn forces the valve D to the right. When the valve is to the right of the steam inlet the steam will rush out as shown by the arrow in Fig. 3. Now that the cylinder A is empty, the piston will return to the bottom, thus turning the fly-wheel again, changing the position of the small valve B (Fig. 2) so that more steam will enter the cylinder at A. As long as there is enough steam in the boiler this process

mer proper and the anvil. In the early pattern, known as the Nasmyth hammer, the hammer was operated by admitting the steam to the lower end of the cylinder and raising the piston. The steam was then cut off and the hammer fell by its own weight. Later improvements admit the steam alternately at the two ends of the cylinder, the same as in the steam engine, and operate much more rapidly and effectively. The hammer is so perfectly adjusted that it can be made to strike a blow of any required force. Steam hammers are used in large forgings, such as gun forgings, shafts for vessels and other like purposes. Electrically-operated hammers are now coming into more general use, and

can be made as powerful as any of the largest steam hammers.

STEAMSHIP. See SHIP.

STEAM SHOVEL, *shuv'el*, an excavating machine for use on land. The huge types used in the excavation of the Panama Canal handled from 4,000 to 5,000 cubic yards of rock or ore daily. These monster machines are also used extensively in digging and loading ore in iron mines of the Great Lakes region and for excavating canals and cuts on railways.

Method of Operation. The steam shovel including the engine, is mounted on a car, so that it can be moved as required. It consists of a hoisting engine and movable crane, with a scoop, or shovel, so attached to the crane that it can be moved in any direction. The bottom of the shovel is attached by a hinge and held in place by a spring. In use the shovel is lowered to the earth, then pulled forward and slightly downward by a chain that winds over a cylinder. This movement fills it. When filled, it is raised by the crane and swung over the point where it is to be emptied. By pulling a cord the spring holding the bottom in place is released, and the shovel empties itself. The capacity of steam shovels varies from one to five cubic yards, but from one and a half to two and a half cubic yards are the sizes generally used.

STEAM TURBINE. See TURBINE, subhead *Steam Turbine*.

STEARIC, ste ar'ik, ACID, a fatty compound contained in the more solid fats of animals such as mutton suet, and in the fat of cow's milk. It is odorless and tasteless, it crystallizes in pearly scales, and is soluble in alcohol and ether. With paraffin it is used for making candles.

STE'ARIN, the chief ingredient of suet and tallow, or the harder ingredient of animal fats, olein being the softer one. It is prepared for practical use from beef suet and cottonseed oil, and it yields an oil used in the manufacture of butterine. Stearin has a pearly luster and is soft to the touch, but not greasy. It is insoluble in water, but soluble in hot alcohol and ether. When treated with superheated steam, it is separated into stearic acid and glycerine, and when boiled with alkalis the stearic acid combines with the alkali and forms soap and glycerine. When melted, stearin resembles wax.

STE'ATITE. See SOAPSTONE.

STED'MAN, EDMUND CLARENCE (1833-1908), a prominent American poet and critic, born at Hartford, Conn. He studied at Yale, took up journalism and was war correspondent of the *New York World* during the Civil War. Later he became a stockbroker in New York and was a member of the Stock Exchange. He contributed to the more important magazines and published his first volume of verse in 1860. His critical work, *Victorian Poets*, appeared in 1875 and has gone through many editions; the *Poets of America* appeared in 1886. Among his volumes of verse are *Poems, Lyrical and Idyllic; Hawthorne and Other Poems; Alice of Monmouth*, and *A Diamond Wedding*.

STEEL, the refined metal that gives strength and stability to the industries of the world, as gold determines the standard of value. It is a variety of iron containing less carbon than cast iron and more than wrought iron. Steel is stronger than iron, can be tempered to any degree of hardness, bent into any desirable shape, and cast in molds. It is the world's most valuable metal and enters into the manufacture of so many things upon which we depend for our commerce and comfort that were its supply suddenly to cease, the industries of the world would have to be reorganized.

In the article IRON the various iron ores are named and the methods of their production and transportation are described. This article treats of the reduction of these ores, their transformation into steel and the uses made of this valuable commodity.

Smelting the Ore. The iron and steel of commerce contain small quantities of carbon, manganese, phosphorus and sulphur, and the ores contain these substances in a much larger proportion, together with sand and other minerals, all of which must be separated from the metal. This is done through the process of smelting, which is carried on in a blast furnace.

The Blast Furnace. The blast furnace is so named because a blast of hot air is employed in producing the high temperature (600° to 900° F.) required in reducing the ore. A blast furnace is usually a tall cylindrical structure, and consists of the following parts: The stack, A; the boshes, B, which are the conical part below the stack; the hearth, H, the charging hopper, C, and the tuyeres, I.



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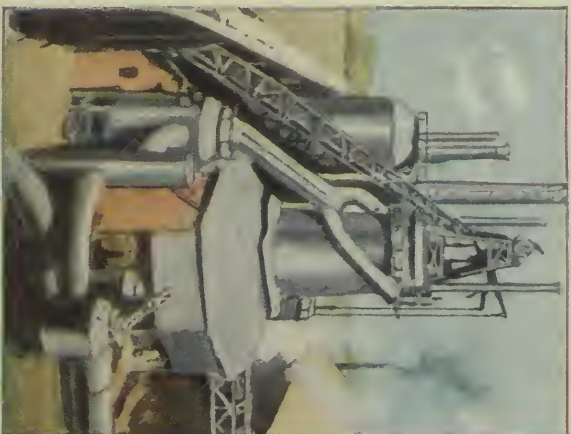
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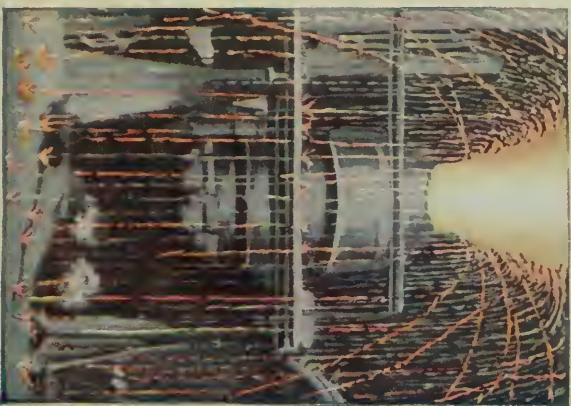
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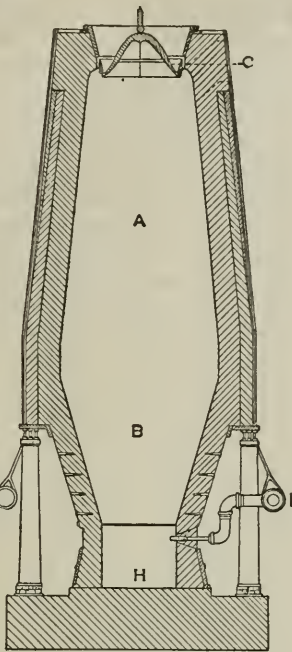
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IRON AND STEEL

- 1, Iron Mine.
- 2, Steam Shovel.
- 3, Ore Train.

- 4, Steamer loading with ore.
- 5, Furnace.
- 6, Bessemer Converter.
- 7, Ingots.

The exterior consists of massive masonry of stone, brick or cement, the body part being lined with two shells of fire bricks, separated by a thin space to allow for expansion. This space is generally filled with sand, ground fire-clay or the like, to hinder the radiation of heat to the outside. When the body rises in the form of a perpendicular cylinder, it is called the barrel. The cone or barrel is sometimes clasped round on the outside by numerous strong iron hoops, or is cased with iron plates fastened to the masonry by iron bolts. The boshes are lined with firebrick or firestone, and the hearth is built with large blocks of stone which will resist the heat. A gallery is built around the top, and to this, material for charging the furnace is hoisted by an elevator. The top is closed by a bell-and-cone arrangement which is opened and shut at pleasure by hydraulic or other machinery. The height of furnaces varies from fifty to eighty feet, and in some cases to upward of one hundred feet, and the greatest width is in most instances not more than one-third of the height.



BLAST FURNACE

Near the furnace are tall cylindrical structures, usually four in number, called *stoves*. Their interior is filled with a checkerwork of brick, which is heated to a high temperature by burning the gas generated in smelting the ore. When this checkerwork in one stove is heated to its highest temperature, the heat is turned to another and the blast of air is forced through the hot stove before it is driven into the furnace. By this means the temperature required to smelt the ore is maintained with the smallest possible consumption of fuel.

The Charge. A charge for the furnace consists of crushed ore, crushed coke and crushed limestone, mixed in such proportions as to secure the largest amount of metal from the ore at the lowest temperature that will gain this result. The limestone acts as a flux, combining with the sand and other minerals and setting the iron free. The charging of the furnace continues at frequent intervals day and night, for when a blast furnace is started it continues in operation until repairs are necessary. The charges are constantly passing downward and undergoing a change as they come nearer the hotter parts of the furnace. Toward the lower part the earthy matter of the ore unites with the limestone and forms a slag, which finally escapes at an opening below the tuyeres, and the molten metal drops down and fills the lower part, to be drawn off at stated periods. This is done usually twice in twenty-four hours, by means of a round hole called a tap. The furnace is constantly kept filled to within about two feet of the top. (See illustration 5 in the color plate.) The molten metal may be run into channels in sand and cast into bars, forming *pig iron* or *pig*; or it may be poured into a ladle and taken to another furnace, for changing the iron to steel before it cools. *Wrought iron* is made by remelting and purifying pig iron. It is soft, tough and flexible. Pig iron contains too much carbon, and wrought iron contains too little, to form steel.

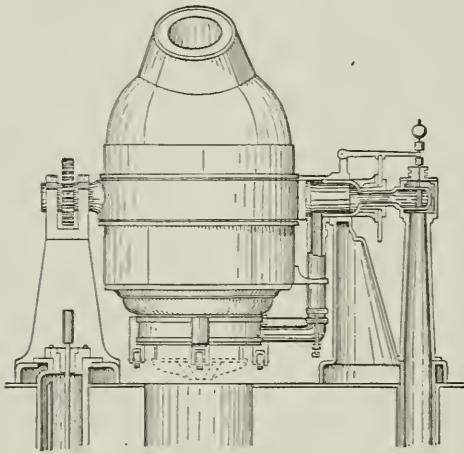
Varieties of Steel. There are a number of varieties of steel, each named from the method employed in its manufacture.

Crucible Steel. This variety is made by the oldest process by which steel is manufactured from iron. Wrought iron bars are laid between layers of charcoal in iron retorts that are lined with fire brick. The air is excluded, and the retorts are placed in a furnace and heated to a yellow heat, the temperature being maintained six or eight days, according to the grade of steel desired. The process is known as *cementation*, and from the appearance of the bars, which, when taken from the retorts, are covered with blisters, this is sometimes called *blister steel*. A small quantity of carbon is added to the wrought iron during the process, thus converting it into steel. With the best quality of wrought iron, this process produces the highest grade of steel. Since the outside of the bars absorb more carbon than the interior, the bars are

usually melted in a crucible and cast in molds or ingots which are of uniform quality. These ingots form the *cast steel* of commerce, from which steel tools and implements of the highest grade are made.

The *electric furnace*, in which the heat is produced by electricity, is now rapidly supplanting the crucible process in making high-grade steel.

Bessemer Steel. This variety of steel takes its name from Sir Henry Bessemer of England, the inventor of the process of its manufacture. In principle it is directly the reverse of the cementation process, which produces steel by burning the carbon into



BESSEMER CONVERTER

wrought iron. Bessemer conceived the idea of making steel by burning carbon out of cast iron, which contains too large a proportion. The furnace in which this is done is known as the *converter*. It is an egg-shaped iron vessel, about fifteen feet high and eight feet in diameter, narrowing at the top to an opening about eighteen inches in diameter. The furnace is lined with fire brick and mounted on trunnions, so it can be tilted to a horizontal position by a hydraulic piston. In most patterns the top is curved, so as to bring the opening to one side. The bottom contains a number of tuyeres, each perforated with holes half an inch in diameter. The tuyeres are connected with an air chamber, which is supplied with air through one of the trunnions, connected by pipes with a powerful blowing machine. The converter is charged directly from the blast furnace or from iron that is melted in a separate furnace, called the *cupola*. In being charged,

the converter is tipped upon its side. As it resumes an upright position, the blast is automatically turned on, and air is forced through the molten metal with a pressure varying from fifteen to twenty-five pounds to the square inch. This burns out the silicon and carbon and produces such violent boiling of the metal as to cause the converter and its foundations to vibrate perceptibly. When the silicon and carbon have been consumed, the blast is shut off, the converter is again tilted upon its side and a small quantity of *spiegeleisen*, an alloy of highly carbonized iron and manganese, is added. After this has been thoroughly mixed with the metal, the charge is poured into ladles, from which it is run into casting molds. The process of converting the charge into steel requires from eight to twenty minutes, and the time is determined by the furnace man, who is able to tell by the color of the flame at the mouth of the converter when the process is completed. As soon as the ingots have cooled enough to retain their form, the mold is taken off and the ingot is moved to the *soaking-pot*, which is another furnace heated by gas. Here the ingots remain until they acquire a uniform temperature and solidity, when they are ready for the *rolling-mill*. (See illustrations 6 and 7 in the color plate.)

Open-Hearth Steel. Open-hearth steel is that made in a furnace constructed on the same plan as that used in making wrought iron. The open-hearth furnace is charged with molten pig iron, scrap steel, iron ore and a small quantity of limestone or fluor-spar. The heat is produced by gas which burns over the charge. The process requires from six to twelve hours. The steel is poured into molds, then treated the same as that produced by the Bessemer process. The chief advantages of the open-hearth process are the opportunity of using scraps and the large quantity of metal that can be treated at one time, from seventy to a hundred tons of steel being made at a heat in the largest furnaces. About three-fourths of the steel produced in the United States is made by the open-hearth process.

Alloys of Steel. A number of other metals when united with steel in small proportions greatly improve its quality for specific purposes. A small quantity of nickel hardens the metal, and *nickel steel* is used in making armor plate for warships, and for steel used in large bridges. *Vanadium steel*

is extensively used in making automobiles, because of its power to resist shocks; *tungsten steel* is used in the manufacture of tools. The addition of from seven to fifteen per cent of manganese makes the metal very tough and hard, and *manganese steel* is used for rock crushers and other machines where great strength is required. Most of the railroad rails are of manganese steel.

Uses of Steel. The uses of steel are so numerous that only a few can be given in this article. Steel has replaced iron in almost everything in the line of construction. The frame of the city skyscraper is steel. We have steel ships, steel locomotives and cars that move on steel rails. Nails are made of steel wire, and our linen is sewed with the finest steel needles. The place of steel in the World War is aptly summarized in the following words:

In the great World War nations opposed each other in terms of steel. The tiny needle of steel carried on the endless work of small sewing; the instrument of steel served the surgeon; vessels of steel transported troops and provisions and policed the sea; the steel helmet protected the man in the trenches; and the shrieking steel shell carried destruction to the enemy. It has been a War of Steel. And, in the work of reconstructing the affairs of man, steel will play a ruling part. Where steel has destroyed, steel will renew. Steel will extend our roads of transportation and form vast bridges. Steel will plow the shell-torn fields and reopen the soil for seed. Steel will support the construction of new buildings and will supply machines and instruments for renewed manufacturing activities. Steel will deliver and protect the necessary supplies of man.

Production. The United States is the leading country of the world in the production of iron and steel (see IRON). Before the outbreak of the World War the other countries in order of their importance were Germany, the United Kingdom, France and Russia. The output of crude steel in the United States in 1919 had reached a potential total of 49,000,000 tons a year.

STEELYARD, in mechanics, a balance, or weighing machine, consisting of a lever of unequal arms. The most common kind, often called the Roman balance, is a lever of the first class (see LEVER). One may find the weight of an object by suspending it from the end of the shorter arm, or placing it in a scale-dish suspended from that arm, and sliding a balance weight, whose weight is known, along the longer arm, until the in-

strument remains in equilibrium in a horizontal position; the weight of the substance attached to the short arm of the lever is ascertained by observing the position of the movable balance-weight, with respect to a graduated scale marked upon the long arm of the steelyard. A ring or hook is attached to the fulcrum, so that the instrument may be conveniently hung upon a fixed support.

STEEN, *stajyn*, JAN (1626-1679), a celebrated Dutch painter, born at Leyden. Few facts of his life are known. One of these is that he worked at Haarlem from 1661 to 1669, the most productive period of his career. His works, which number about 500, are remarkable for draughtsmanship, clear, transparent color and keen humor. Steen delighted especially in scenes of Dutch life, and he ranks with Hogarth as a master of pictorial satire. No other Dutch painter save Rembrandt surpasses him in variety of subject, accuracy of treatment and in dramatic gifts. Fine examples of his work are *Eve of Saint Nicholas*, *The Rustic Wedding* (both at Amsterdam), *The Menagerie* (The Hague) and *The Music Master* (London National Gallery). Representative canvases are owned by the Metropolitan Museum, New York.

STEF'ANSSON, *sta'fahns sohn*, VILH-JALMUR (1879-), a Scandinavian explorer, who, as head of an expedition, discovered in 1915 a hitherto unknown island in the Arctic Ocean. The expedition was under the auspices of the American Museum of Natural History and the National Geographic Society (U. S.), and was financed by the Canadian government. Stefansson sailed from Victoria, B. C., in June, 1913; and the following spring, although the largest of his ships had been lost, he proceeded northeastward from Alaska. A feature of his trip was a three months' journey by sledge across floating ice. In February, 1915, he left Cape Kellett, Banks Land, and proceeding north discovered, on June 18, near the 78th parallel, a mountainous island about a hundred miles long. He made subsequent surveys of importance in Arctic regions. See NORTH POLAR EXPLORATION.

STEFFENS, LINCOLN (1866-), an American writer and lecturer. He was born in San Francisco, was graduated from the University of California and later studied at Berlin, Heidelberg, Leipzig and Paris. He served as reporter and editor on New York papers and afterwards became editor succes-

sively of *McClure's Magazine*, *The American Magazine* and *Everybody's Magazine*. He has contributed to magazines numerous stories and articles dealing with serious subjects of current interest. Among his books are *The Shame of the Cities*, *The Struggle for Self-Government*, *Upbuilders* and *The Least of These*.

STEINBOCK, *stine'bok*, or **STEEN'BOK**, a small antelope, found in South Africa, where its rocky habitat suggested the Dutch name, meaning *stonebuck*. It is ashen-gray on the sides, white underneath and stands about two feet in height; the male has short horns. The name is also applied in Europe to the ibex.

STEMS, the parts of plants which support leaves. Though stems in some plants are all underground, in most cases they serve to keep the leaves and flowers of plants in the sunlight; they always form channels by which the liquids in circulation can reach the leaves from the roots. The stems of some plants live but one year; others live two years, and still others may live on indefinitely from year to year. The methods of growth vary with the species, sometimes being directly upward from a terminal bud, making a cylindrical, upright tube; sometimes branching regularly, but still standing upright. Other stems are weak and rise by climbing only, either by their rootlets, or tendrils, or by twining round and round some slender support. The tuber of the potato or the root-stock of Solomon's seal are examples of underground stems. Other condensed forms are found above ground, as may be seen in the peculiar tips that the cactus family exhibits. The living parts of the dicotyledonous plant are confined to the narrow zone just under the outer bark and outside the main core of the tree. In monocotyledonous plants, however, the stem grows in restricted areas throughout the whole diameter. Cross sections of stems show very clearly the structure of the two forms; the dicotyledons show concentric rings of woody matter, while monocotyledonous plants are of rather uniform pithy structure, with fibrous bundles. See **BOTANY**; **LEAVES**.

STENCIL, *sten'sil*, a thin sheet of metal, cardboard, or other material with letters or designs cut in it. Stencils are much used in marking shipping boxes, in cases where the same marking is repeatedly used. The stencil is laid flat on the box and is painted

over with a brush saturated with ink. The ink touches the box only through the stencil openings. Stencils are sometimes used in transferring designs to walls.

STENOGRAPHY. See **SHORTHAND**.

STEPHEN, *sté'ven*, (about 1097-1154), king of England, son of Stephen, count of Blois, and Adela, a daughter of William the Conqueror. His uncle, Henry I, gave him the earldom of Montaigne, in Normandy, and large estates in England, in return for which he took the oath to secure the succession to Henry's daughter, Matilda. But when his uncle died, in 1135, he hastened from France to England, laid claim to the crown for himself and was crowned in London. In 1139 Matilda landed in England with her half-brother, the earl of Gloucester, and a civil war ensued, in which Stephen was taken prisoner and Matilda was acknowledged queen. The conduct of the new sovereign, however, excited an insurrection against her government, and she was shut up in Winchester Castle, while the earl of Gloucester was taken prisoner. Stephen was exchanged for the earl, and the war was renewed. When Matilda retired to Normandy, the contest was taken up by her son Henry. Finally the struggle was brought to an end in 1153 by the Treaty of Wallingford, in which it was agreed that Stephen should reign until his death, and that he should be succeeded by Henry.

STEPHENS, ALEXANDER HAMILTON (1812-1883), an American statesman, born near Crawfordsville, Ga. He spent his childhood amid the greatest poverty, received his education at Franklin College, through the assistance of a charitable organization, and in 1834 was admitted to the bar. He later repaid his helpers with interest.

Stephens was elected to the Georgia legislature in 1836 and to Congress in 1843, where he at once assumed prominence as a fearless advocate of the rights of the South, though at the same time a lover of the Union. In 1860 he opposed secession, not because he believed it wrong in principle, but because he deemed it inexpedient at the time. At the Georgia session convention he delivered a great speech for the Union, but when Georgia seceded he remained loyal to the state and became Vice-President of the Confederacy. He headed the Confederate peace commission at Hampton Roads, in February, 1865. At the close of the war he was im-

prisoned five months at Fort Warren, in Boston Harbor. In 1866 he was elected to the United States Senate, but was not allowed to take his seat. He entered Congress, however, in 1873, and remained there until 1882, when he was chosen governor of his state. In every position in which he was placed Stephens acted with the highest of motives and with deep conviction. His career constantly exemplified rare moral courage and devotion to principle.

STEPHENSON, *ste'ven son*, **GEORGE** (1781-1848), an English engineer and inventor, who built the first railway locomotive. While an engine-wright at Killingworth, he constructed a locomotive for the tramways and succeeded in inducing the projectors of the Stockton & Darlington railway to adopt it. The result was that in 1825 the first railway was built, over which passengers and freight were borne by locomotives. Stephenson was then employed to construct the Liverpool & Manchester railway, the directors of which accepted his locomotive, called the *Rocket*, which at the trial trip in 1830 ran twenty-nine miles in an hour, a high rate of speed in that day. Stephenson was afterward identified with numerous railway undertakings throughout England, and he invented a miner's safety lamp. See **LOCOMOTIVE**.



**GEORGE
STEPHENSON**

STEPHENSON, **ROBERT** (1803-1859), an English engineer, born at Wallington Quay, England, the son of George Stephenson. He received an excellent technical education and began his active career as his father's assistant in railroad surveying. He then took charge of his father's factory at Newcastle and greatly aided him in improving the locomotive. His services as a railway civil engineer were in great demand, and in time he became celebrated as the builder of great bridges. He was the inventor of the tubular bridge; the most celebrated of these bridges are the Britannia Bridge over the Menai Straits, the Conway Bridge and the first Victoria Bridge across the Saint Lawrence at Montreal. This last was replaced by a steel

truss bridge in 1898. See **BRIDGE**, subhead *Tubular Bridges*.

STEPPE, *steps*, the vast treeless plains extending from the River Dnieper eastward across Southern Russia and embracing Southwestern Siberia. During most of the year they are dry and barren, but after the spring rains they are for a short time covered with verdure and furnish pasturage for the flocks and herds of wandering Tartar tribes. See **PLAINS**.

STEREOP'TICON. See **MAGIC LANTERN**.

STEREOSCOPE, an optical apparatus which enables one to look at the same time upon two photographic pictures, nearly the same, but taken under a slight difference of angular view, so that each eye looks upon one picture only. The effect is similar to that produced by natural vision. The two lenses are mounted in a frame having a handle and a bar extending outward. To this bar is attached a rack for holding the card on which the duplicate photographs are printed. A reflecting form of stereoscope was invented by Wheatstone in 1838. Subsequently Brewster invented the refracting stereoscope, based on the refractive properties of the halves of double-convex lenses. This is the one which was so popular a few years ago.

STEREOTYPING, *ster'e o type ing*, the process of impressing pages of type or of engraving in type metal and of making stereotype plate.

The type is set and locked in the form, then sent to the foundry, where the face is brushed clean with a soft brush dipped in oil. A thick, soft paper, especially prepared for the purpose, is then pressed down upon the type with a heavy iron roller. The face of the type is forced into the paper, so as to make a perfect mold of the page; this mold is called a *matrix*. After drying, the matrix is taken from the type and placed in a casting box. Melted type metal is then poured over it, making a plate which is a perfect copy of the type. The stereotype plates made for ordinary printing presses are flat. Those made for the presses used in large newspaper establishments are in the form of half-cylinders.

Several casts can be made from the same matrix. In all large cities there are firms which specialize in supplying country papers with plates for printing a portion of their paper. The time consumed in making a stereotype plate is about ten minutes. Since such

plates are inexpensive and are quickly made, they are especially valuable for printing daily papers and cheap editions of books. For higher grade of work the electrotype has displaced the stereotype.

Related Articles. Consult the following titles for additional information:

Electrotyping	Printing
Newspaper	Printing Press

STERNE, *sturn*, LAURENCE (1713-1768), an English author who made distinct contributions to the development of the English novel. After his graduation from Cambridge in 1736 he was ordained and went at once to a pastorate in Yorkshire. There he remained twenty years, devoting himself to reading and writing in his leisure moments. In 1759 appeared the first two volumes of his longest work, *Tristram Shandy*, which, by their humor, whimsicality and happy audacity of tone and treatment, gained instant popularity. The publication of this work was continued, the ninth and last volume appearing in 1767, and Sterne found himself exceedingly popular in London, whither he had moved. His other writings are *A Sentimental Journey Through France and Italy* (1768) and a number of sermons, besides letters published after his death. Though disfigured in places by the sort of vulgarity which was characteristic of the age, Sterne's *Tristram Shandy* and *Sentimental Journey*, especially the former, contain some of the finest humor in English literature.

STETHOSCOPE, an instrument by means of which the sounds of the heart and lungs are distinctly heard and the condition of these organs is ascertained. The most improved apparatus consists of a tube, one end of which flares like a bell; the other is attached to a forked tube with two earpieces. The bell is held against the chest or over the heart of the patient, while the physician listens with the aid of the earpieces.

STETTIN, *stet teen'*, the capital of the Prussian province of Pomerania, situated on both sides of the Oder and about eighty miles northeast of Berlin. It is one of the principal ports of Germany and its ship-building yards are among the largest in the world. It is the most important manufacturing center in the province. The chief mill products are chemicals, machinery, clothing and sugar. The trade is principally in fish, petroleum, corn, wood and wine. Among the objects of interest are the Municipal Museum, the town hall, the former

Ducal Palace and the churches of Saint Peter and Saint James. Population, 1910, 236,113.

STEUBEN, *stu'ben* or *stoi'ben*, FRIEDRICH WILHELM AUGUST, Baron von (1730-1794), a Prussian general, who fought in the American Revolution. He was born in the fortress at Magdeburg and at the age of fourteen entered the Prussian army. In 1758 he was made adjutant-general, and he fought with distinction during the Seven Years' War, becoming at its close grand marshal of the prince of Hohenzollern-Hechingen. In 1777, at the solicitation of Benjamin Franklin, he went to America and offered his services to Congress. He immediately was dispatched to Valley Forge, where, during the winter, he drilled the army in military tactics, in which he had received special instruction from Frederick the Great. He was made inspector-general and instituted many important reforms. He fought at the Battle of Monmouth, was a member of the André court martial, put an end to the marauding invasions of Benedict Arnold in Virginia and took a prominent part in the siege of Yorktown. At the close of the war he was granted large tracts of land by several states and a pension of \$2,400 by Congress; and he spent the remainder of his life in America.

STEUBENVILLE, *stu'ben vil*, OHIO, the county seat of Jefferson County, forty-three miles southwest of Pittsburgh, Pa., on the Ohio River and on the Pennsylvania, the Pittsburgh, Cincinnati, Chicago & Saint Louis and the Wheeling & Lake Erie railroads. The city is in a section having deposits of coal, gas and petroleum, and it has extensive manufactures of iron, steel, paper, electric light bulbs, glass and pottery. Some important features are a city hall, a courthouse, a Carnegie Library, Gill Hospital, a Y. M. C. A. building and Stanton and Altamont parks. The town was laid out in 1798, on the site of a fort named in honor of Baron Steuben. It was chartered as a city in 1851. Population, 1910, 22,391; in 1917, 28,259 (Federal estimate).

STEVENS, THADDEUS (1792-1868), an American statesman, born at Danville, Vt. He graduated at Dartmouth College, taught school and was admitted to the bar, practicing at Gettysburg and Lancaster, Pa. He was elected to the legislature as a Whig in 1833, where he served with rare energy and ability, and was elected to Congress in 1849.

There he was a leader of the anti-slavery forces for two terms and again in 1859. As one of the Republican leaders in Congress he was the chief advocate of emancipation and negro suffrage and of the radical reconstruction measures, and he led the impeachment of President Johnson. Though bitter and sarcastic in debate, he was famous for his indiscriminating charities.

STEVENSON, ADLAI EWING (1835-1914), an American statesman, Vice-President of the United States from 1893 to 1897. He was born in Christian County, Ky., and was educated in the common schools there and at Center College, Danville, Ky. In 1852 his parents moved to Illinois, where he was admitted to the bar five years later. In 1874 he was elected a member of Congress from Illinois by the Democratic party, and in 1885 was appointed first assistant Postmaster-General. At the conclusion of his term as Vice-President he was appointed a member of the commission to try to secure international bimetalism. He was nominated for Vice-President in 1900, on the ticket with Bryan, but was defeated.

STEVENSON, ROBERT (1772-1850), a Scotch engineer, born at Glasgow. His first work of importance was the erection of a lighthouse on Little Cumbræ. He was for forty-seven years inspector of lighthouses, and during that time he built twenty-three lighthouses on the Scottish coast, the most colossal of these undertakings being the construction of the lighthouse on the submarine Bell Rock. Stevenson introduced many improvements in the construction of bridges, canals, harbors and railways and invented the system of *intermittent* and *flashing* lights. See **LIGHTHOUSE**.

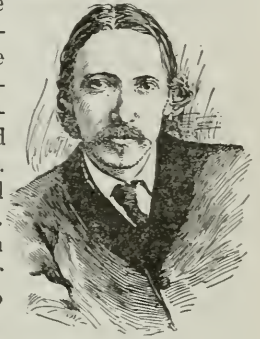
STEVENSON, ROBERT LOUIS BALFOUR (1850-1894), a Scottish poet, essayist and writer of fiction, born in Edinburgh. He studied law and was admitted to the Scottish bar, but found his true calling in literature. A leisurely journey through France and Belgium by canoe supplied material for *An Inland Voyage* (1878), and a walking tour in southern France was described in the following year in *Travels with a Donkey*. At this time were published, too, in various periodicals, the stories and essays, some of them among his best, which were afterward collected as the *New Arabian Nights*, *Virginibus Puerisque* and *Familiar Studies of Men and Books*.

Learning in 1879 of the severe illness of Mrs. Osbourne, whom he had met some years previously, he decided to go to California, her home. He made the voyage in the steerage of an emigrant ship, and finished the journey across the continent in an immigrant train. These experiences he described in *The Amateur Emigrant* and *Across the Plains*.

In 1880 he married Mrs. Osbourne. During the next ten years his quest for health took him to various places, and in 1890 he settled permanently in Samoa, where he soon became a commanding figure among the natives. Meanwhile he had published *Treasure Island*, a story of stirring adventures which met with immediate success; *Prince Otto*, a romance; *Doctor Jekyll and Mr. Hyde*, an account in story form of the dual personality which exists in every man; *Kidnapped*; *The Master of Ballantrae*; *A Child's Garden of Verses* and *Underwoods*, a second volume of verse, and the *Merry Men and Other Tales*. During his years in Samoa he wrote *David Balfour*, which is a sequel to *Kidnapped*, and *Saint Ives*, and he began *Weir of Hermiston*, which, although unfinished at his death, is by many critics regarded as his greatest work.

Stevenson's uncomplaining spirit, his cheerfulness and diligence in the face of disadvantages so great that to a less courageous man they might have seemed overwhelming, make him one of the most attractive of literary personalities. As a story-teller he rivals Scott, while his exquisite style places him in the front rank of the writers of his time.

STEVENS POINT, WIS., the county seat of Portage County, 100 miles north of Madison, on the Wisconsin River and on the Minneapolis, Saint Paul & Sault Ste. Marie and the Green Bay & Western railroads. The city is an important trade center for an extensive region and lies just north of the great potato-producing district. There is good water power, and more than one hundred industrial establishments, which include saw mills, foundries, knitting works and manufacturing of furniture, paper, fishing flies and



ROBERT LOUIS
STEVENSON

other articles, are located here. The city has a Carnegie Library and is the seat of one of the state normal schools. The place was settled in 1836. Population, 1910, 8,692; in 1917, practically unchanged.

STIBNITE, or **ANTIMONY GLANCE**, an ore consisting of antimony and sulphur. The color is lead-gray or blackish, and the mineral is very brittle. This ore is the source of most of the antimony of commerce.

STICKLEBACK, the popular name for certain small fishes, so called because of their dorsal spines. These fishes are found in both salt and fresh waters, are very active and voracious and live upon aquatic insects and worms. The sticklebacks are among the very few fishes which build nests for their young. The nest is composed of straw, sticks and similar materials, and is shaped like a muff. In it the eggs, yellow in color and about the size of poppy seeds, are deposited. The male guards the nest until several days after the eggs are hatched. The largest sticklebacks attain a length of seven inches.

STIKINE, *stik een'*, **RIVER**, a small river in Western Canada which furnishes water communication between Northern British Columbia and the Pacific. From the Cassiar Mountains, in Northern British Columbia, where it rises, it flows northward, then westward and southward, and after crossing the narrow southern strip of Alaska, enters the Pacific, traversing a distance of 335 miles and draining an area of 20,000 square miles. It is navigable for 170 miles.

STILLWATER, **MINN.**, the county seat of Washington County, eighteen miles northeast of Saint Paul, on the Saint Croix River and on the Northern Pacific, the Chicago & North Western and the Chicago, Milwaukee & Saint Paul railroads. It has a beautiful location near the Dalles, which extend about thirty miles to the north along the river. The Minnesota state prison is located here, and the municipality contains a Carnegie library, a fine city hall, two convents and a city hospital. It is the industrial center of a large lumber region. The industrial establishments include lumber mills, grain elevators, flour and feed mills, foundries and machine shops and manufactories of wagons, boats, farm implements, shoes and other articles. Stillwater was settled in 1843, was incorporated as a village in 1848 and chartered as a city in 1854. Population, 1910, 10,198; in 1917, practically unchanged.

STILT, a plover, with exceedingly long, slender legs, which fact gives it its common name. It lives in fresh and salt marshes and feeds on insects. Few birds have greater power of flight, either in distance or rapidity.

The stilt is always a peculiar-looking bird, whether walking as if on stilts or flying, with its long legs awkwardly stretched out behind it. There is only one North American species, the *black-necked stilt*, of the temperate regions. It is about fifteen inches long, is white beneath and black above, with bright-red legs. The nest is a depression in the ground, lined with grasses.



STILT

STILTS, long sticks, to which are fastened foot rests, by means of which it is possible to walk with the feet some distance above the ground. The stilts used by children for playthings usually have long handles, which pass under the arms and are held by the hand. In countries where stilts are used for practical purposes, they are bound to the side of the leg, and the wearer carries a long pole to assist him in keeping his balance. The inhabitants of the lowlands in southern France find stilts a necessity a good part of the year, as much of the land is under water.

STING RAY, a group of fishes characterized by a long, whiplike tail equipped with one or more sharp spines near its base. This spine, or "sting," is not poisonous, but it inflicts a painful wound. There are about fifty species of these rays. All have flat disk-shaped bodies and some are from ten to twelve feet in diameter. They inhabit warm waters and have been found in tropical South American rivers.

STOAT. See **ERMINE**.

STOCK. Stock is that which represents the capital of a corporation. It should be understood in this article that, in speaking of stock, only the stock of corporations is meant. For instance, the capital stock of a certain corporation is \$30,000,000; in other words, that sum of money is invested, or is supposed to be invested, in that company. The people whose money makes up this total own *shares*, of a par value of \$100 each, or other

smaller sum. To show that an investor owns shares he receives a *certificate*, which indicates the number of shares issued to him and usually the par or face value of each share. Each certificate is numbered, and the complete record of the certificate is kept on the company's books. The company, out of its profits, pays *dividends* to its stockholders, but before dividends are paid the directors must *declare* or vote the dividends. Thus it is customary to say that the "directors declared the regular semi-annual dividend of three per cent," or whatever it may be. Dividends are usually declared twice a year, but monthly, quarterly or annual payments are also common.

Common and Preferred Stock. There are two principal kinds of stock, *common* and *preferred*. The preferred stock receives dividends at a fixed rate, and this rate must be paid before the common stock receives any dividends. Owners of preferred stock, however, usually are not allowed to vote at the meetings of the corporation. In other words, the preferred stock is like a loan. If the preferred stock is *cumulative* it shares in the profits of the business over and above the amount needed to pay equal dividends to both common and preferred stockholders. *Participating* preferred stock entitles the owner to vote at all meetings and gives him the same rights as a holder of common stock. A *proxy* is a form of power of attorney by which one stockholder authorizes another to act for him. Ownership of a majority of the common stock is necessary to control the affairs of the company. A stockholder is entitled to as many votes as he has shares.

Market Prices. Stock is usually issued at a *nominal*, or *par*, value. The usual par value of a share is \$100, but shares of a par value of \$1, \$5, \$10, \$25 and \$50 are not rare. Par value is like the words on a coin which say it is worth a certain amount of money. Market value or price is determined by the earning power of a company. For example, the common stock of a certain company pays 5 per cent dividends a year. This is a fair return on the investment, the normal rate of interest on money loans being about six per cent. In consequence, the common stock fluctuates in market price from a little below par to a little above. If, however, the company's business warranted dividends of 10 per cent a year, the market price would jump to about \$175 or \$200 a share. The propor-

tionate return on such an investment would be the same as in the first case; the people to profit by the rise in price would be those who had paid the low price and were now receiving the high rate of interest. In some states in recent years stocks are issued without a par value, the market value alone indicating the standing of the issue.

Purchasers of stock must bear in mind the difference between investment and speculation. A man may be willing to accept a low return on his money if he knows that the principal is safe, but if there is any danger that he will lose his principal, he demands a high interest. This fact explains why the stock of mining companies, for example, often pays as high as twenty or thirty per cent (or even more) interest on the amount invested. On the other hand, if the business is of a conservative nature, large profits will result in a rise in the market price of the stock.

Related Articles. Consult the following titles for additional information:

Broker Corporation Stock Exchange

STOCK EXCHANGE, an organization of business men engaged chiefly in buying and selling stocks and bonds. The name is also applied to the building where these financial operations are carried on. The first stock exchange was organized at London in 1801. In the early years of the stock exchange a member might trade there any sort of security he wanted to handle. The good stock and the bad had equal chances of getting the purchaser's attention. Ultimately this defect was recognized; a sort of censorship was instituted, and a list was made of all securities which might be exchanged. To-day a company which wishes to market its stock on the exchange must prepare for the board of control a financial statement and submit it to the exchange. If the board is satisfied as to its value, the stock is placed on its list of recognized securities. If it is rejected it must be sold on the "curb," that is, the street, if sold at all. Under normal conditions the exchange as a body does not attempt to control prices and is not responsible for fluctuations. The number of those who are constantly trying to boost prices and of those who are trying to lower them is about equally divided, and equilibrium is thereby maintained.

Membership in stock exchanges is limited to the number of those who can conduct the

business to be done. The cost of a seat fluctuates according to financial conditions. In 1896 a seat on the New York Stock Exchange was worth \$20,000; in 1905 to 1906, \$95,000. In normal times the price of membership on the stock exchange of Saint Louis, Baltimore, Philadelphia and Chicago ranges from \$1,500 to \$5,000. The payment of the membership fee is only a step in the initiation. One must be formally recommended and then elected by vote.

STOCKHOLM, SWEDEN, the capitol and chief city of the country, is beautifully situated on the east end of Lake Malar and a number of islands and peninsulas which are separated by fiords and surrounded by forests. Because of this feature Stockholm has been called the "Venice of the North." The older portions of the city have narrow streets, but the newer parts are laid out on modern plans and contain numerous squares, which are ornamented with monuments and statuary. There are also a number of beautiful parks about the city. The most important structure is the royal palace. Other buildings of importance are the customhouse, the exchange bank, the townhall, the parliament house and the national library, national museum and academy of arts and sciences. Among the churches worthy of mention are the Stor Kyrka; the Riddarholms Kyrka, which is the burial place of the Swedish kings, and the Katarina Kyrka. The city also contains a monument to Gustavus III and statues of Gustavus Adolphus and Charles XII.

There are a number of important educational institutions, including a polytechnic school, a school of forestry and a medical institute. The royal library has over 300,000 volumes and a large collection of pamphlets. Among the learned societies are the Royal Swedish Academy of Sciences and the Swedish Academy. Stockholm is an important industrial center and has manufactures of furniture, tobacco, soap, sugar, malt liquors, and foundry and machine shop products. Shipbuilding is also an important industry. The city has a large trade, and its imports outrank those of any other city of Sweden. Population, 1917, 408,972.

STOCKTON, CAL., the county seat of San Joaquin County, seventy-eight miles northeast of San Francisco, on an arm of the San Joaquin River, at the head of navigation, and on the Atchison, Topeka and Santa Fé, the

Western Pacific and the Southern Pacific railroads and several interurban lines. The city is the center of a rich agricultural and dairying region, which is noted for its natural beauty and equable climate. It was the outfitting point for the miners who went to California in the "rush of '49," and is the gateway to the Yosemite National Park.

It is the trade center of the San Joaquin valley and handles large amounts of lumber, grain, live stock, fruits and vegetables. There are oil and natural gas wells in the valley, and the manufactures include agricultural and mining implements, flour, foundry products, window glass, leather, woolens, canned goods, soap and fuel briquettes. The Western Normal, the state hospital for the insane, Saint Mary's College and Saint Agnes Academy are located here. The city has a public library and a county law library. Notable structures are a courthouse, a post-office, the Masonic Temple, the Commercial and Savings Bank building and Farmers and Merchants Bank building. The place was founded by Charles M. Weber in 1849 and was named in honor of Robert Field Stockton of the United States Navy. It adopted the commission form of government in 1911. Population, 1910, 23,253; in 1917, 36,209 (Federal estimate).

STOCKTON, FRANCIS RICHARD (1837-1902), an American writer of humorous stories, born at Philadelphia. After graduation from the Philadelphia high school he applied himself to wood-engraving and contributed numerous illustrations to books and magazines. But he soon abandoned this pursuit for journalism. He was employed successively on the Philadelphia *Post*, the New York *Hearth and Home*, *Scribner's Monthly* (afterward the *Century Magazine*) and *Saint Nicholas*. His reputation rests, however, upon his short stories and humorous sketches. He told the most impossible tales with a realistic effect irresistibly humorous. He wrote several novels and a number of children's stories. His first work which attracted general notice was *Rudder Grange*. His best-known stories are *The Lady or The Tiger?*, his most popular story; *The Late Mrs. Null*, *The Casting Away of Mrs. Lecks and Mrs. Aleshine*, *The Merry Chanter*, *Captain Horn* and *The Girl at Cobhurst*.

STODDARD, RICHARD HENRY (1825-1903), an American poet, critic and essayist,

born at Hingham, Mass. He learned the trade of an iron molder and worked at it for several years. Ultimately he began to write for periodicals, and in time devoted much attention to literature. From 1853 to 1870 he worked in the New York custom-house; from 1886 until his death he was editor of the *New York Mail and Express*. Among his numerous writings are *Footprints*, *Songs of Summer*, *The King's Bell*, *The Book of the East* and *Memoir of Edgar Allan Poe*.

STOICISM, *sto'i siz'm*, a system of philosophy developed by Zeno in the latter part of the fourth century B. C. The name comes from *stoa*, meaning *porch*, the place at Athens where he taught. Zeno was highly esteemed by the Athenians, and he lived to an advanced age; after his death his system was continued and perfected by his followers. Stoicism became firmly established in Rome, and numbered Cicero, Seneca, Marcus Aurelius and other eminent Romans among its adherents.

Fundamentally, stoicism is the doctrine "that no external thing alone can affect us for good or evil until we have woven it with the texture of our mental life." In other words, it does not influence us unless we permit it to determine our thoughts or acts. Necessarily the doctrine presupposes belief in freedom of the will.

Since the founding of stoicism its doctrines have exerted wide influence in all ages, and in a modified form they are still found in the ethical codes of many social and political organizations. Its chief ethical value is its insistence upon the unimportance of external circumstance as compared with our reaction to it. Courage, self-control, temperance and justice are among the virtues it inculcates.

In the popular sense a *stoic* is one who is not easily excited, who represses his emotions and is apparently or professedly indifferent to pain and not dependent for happiness upon worldly pleasure.

STOMACH, *stum'ak*, an organ of digestion, formed by the expansion of a portion of the alimentary canal. The human stomach is situated on the left side, just below the diaphragm. It is cone-shaped and turns up at both ends. It has four coats—the serous, or outer; the muscular, which serves to force the food, after it is made into chyme, toward and through the pylorus, to keep the orifice closed till the food is digested and to mix the food thoroughly with the gastric juice;

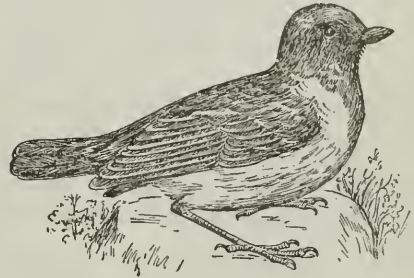
the cellular coat, and the inner, or mucous, coat, which is soft, smooth and velvety and contains the glands which secrete the gastric juice. It has been estimated that there are 5,000,000 openings of these glands in this membrane. The stomach has two openings, the cardiac through which the food enters from the œsophagus, and the pyloric, through which the food enters the intestines. See DIGESTION.

STONE. See ROCK.

STONE AGE, that period in the history of any people during which their tools and weapons were made of stone. From the relics that are found in various parts of Asia, Africa and America, it seems evident that stone was the first material used by any people for tools and weapons.

The implements which have been found naturally divide the Stone Age into two epochs. During the first of these, the implements were rude and simple. Later relics are of many varieties of stone, and some are highly polished; a greater variety, too, is seen—axes, hammers, knives, daggers, spear and arrow heads, saws, chisels, borers and scrapers, all have been found. We know that the people of the Stone Age had some domestic animals and that they built rude houses and, in some cases, put together large mounds of stone as burial places for their dead. People in isolated regions, like the islanders of the Southern Pacific and the Eskimos of the extreme north, are still in the stone age period of their development. See BRONZE AGE; IRON AGE; LAKE DWELLINGS.

STONE CHAT, a common European bird, which lives upon moors and in other open places. It belongs to the warbler family.



STONE CHAT

The peculiarity of its note, which sounds somewhat like two small stones struck together, gives it the name. The bird runs very rapidly and feeds on worms, beetles, insect

larvae and grains. The eggs, from four to five in number, are greenish-blue and spotted. The blue Irish titmouse is a stone chat.

STONEHENGE, *stone'henj*, a celebrated ruin of what is believed to have been a pre-historic place of worship, situated in Wiltshire, Southern England. It consists of a group of huge, rough-hewn stones, from the positions of which it is believed the original plan embraced a horseshoe of stone blocks enclosed within two circles of stones. The outer circle, which is about three hundred feet in circumference, consisted, when entire, of thirty upright stones, each about sixteen feet high, placed at intervals of three and one-half feet, with thirty squared stones resting upon them. The inner circle, which is eight feet from the outer, consisted of about thirty stones, six feet in height, without imposts. The horseshoe consists of five groups of three stones, two uprights with an impost. Before each group stood three smaller upright stones. Inside this is a large slab, supposed to have been an altar. The whole is surrounded by a double mound and ditch, and there is also an avenue leading from the northeast, bounded by a mound and ditch. These circles were probably formed in connection with the Druidical or some other old religion. Originally private property, Stonehenge was presented to the British government as a national memorial in 1918.

STONE MOUNTAIN, an enormous, gray granite rock, a few miles northeast of Atlanta, Ga., which is to be made into a Confederate memorial. The rock mass is 800 feet high and 1,500 feet long. It is planned to cover part of the surface with relief sculpture representing Confederate soldiers mounted and on foot. The figures will be fifty feet high and seen from a distance the whole will show a great army marching forward, part of it mounted, part on foot. Many of the figures will be portraits of Civil War leaders—Lee, Stonewall Jackson and others. The undertaking is in the hands of the Stone Mountain Confederate Memorial Association. The work will be under the direction of Gutzon Borglum (which see).

STONE RIVER. See MURFREESBORO, BATTLE OF.

STONES, PRECIOUS. See PRECIOUS STONES.

STONY POINT, N. Y., a town in Rockland County, at the head of Haverstraw Bay, on the Hudson River, forty-two miles north of New York City, on the West Shore and

other railroads. It is on a rocky promontory, which was fortified by the Americans early in the Revolution. The fort was captured, strengthened and garrisoned by the British under Clinton in May, 1779. Washington then ordered General "Mad Anthony" Wayne to regain this position. On July 16, with 1,200 men, he surprised the fort at midnight, entered it with a rush and forced the garrison to surrender at the point of the bayonet. The Americans did not fire a gun; they lost fifteen men killed and eighty-three wounded; the British lost sixty-three killed and 553 captured. Soon after the capture the fortifications were destroyed and the place was abandoned. The ruins of the fort are included in a small national park created in 1902. Population, 1910, 3,651.

STORAGE BATTERY. See ELECTRIC BATTERY.

STORK, a large, long-legged bird related to the heron. It frequents swamps and marshes, but is sometimes found in the haunts of man, and occasionally builds its nest on the roofs of inhabited houses. The birds eat frogs, eels and reptiles, and have an economic usefulness. In parts of Europe they are venerated and are birds of good omen. They have no voice; the only sound they utter is a peculiar clattering of the bill.



STORK

The common stork is found in summer throughout Europe and Central Asia. In winter it migrates southward. This bird has black wing coverts, but otherwise the plumage is white. The bill, legs and toes are reddish. A pair returns year after year to the same nest. The eggs are white and from four to five in number. The South American storks are the *maquari* and the *jabiru*. The Asiatic species are the *Japanese stork*, the *white-necked stork*, the *black stork* and the *adjutant*.

STORMS, violent disturbances of the atmosphere, usually accompanied by rain, snow and hail, sometimes by thunder and lightning. Storms are *general* or *local*, and are occasioned by the unequal heating of the atmosphere, which causes unequal pressure over adjoining areas.

Fair and foul weather follow each other in continuous succession over most of the world. The frequency and violence of the changes may vary at different seasons of the year, but in general these are due to local conditions.

A study of the weather maps issued by the United States Weather Bureau shows that there are always in the country one or more areas of low pressure, surrounded by areas of high pressure. The areas of low pressure are those of low barometer and high temperature. They may have a diameter of from 500 to 1,000 miles, and the winds blow toward them from all directions. In the center of the low pressure areas, condensation takes place, followed by rain or snow.

Storm Centers. In the temperate latitudes of the northern hemisphere, the storm center moves eastward, its course usually being from southwest to northeast. In the tropics its direction is westward. In the southern hemisphere, these directions are reversed. The storm centers which move across the United States are usually lost in the Atlantic, only a few reaching Europe. When they do extend thus far, they usually strike the continent north of the British Isles; so in a few instances they have been known to strike the British Isles and even extend as far south as France and Spain. The rain-bearing wind usually comes from the southwest or south, and the area of low pressure is succeeded by one of high pressure, from which the wind blows outward. A north or northwest wind produces a clear sky, a high barometer and a low temperature. In the northern Mississippi valley such a wind often causes a drop of 15° or 20° in the thermometer in less than an hour.

Storms of this character are *cyclonic* in their nature; that is, they are caused by currents of air moving from all directions into the area of low pressure, and have a rotary motion on a large scale. They are most frequent in the spring and autumn months. Over the sea, in the tropical latitudes, they often attain such violence as to be destructive to shipping. These storms should not be confounded with the so-called cyclones of the United States, which are tornadoes and cover only a very small area.

Storm Predictions. General storms can usually be predicted from one to two days in advance. They are preceded by a falling barometer, a rise in temperature and cloud-

iness in the west, which usually begins with the formation of long streaks of cirrus clouds. Storms may last from one to ten days, according to the area which they cover and the rapidity with which the area of low pressure moves forward, but their duration seldom exceeds three days.

Related Articles. Consult the following titles for additional information:

Blizzard	Snow
Cyclone	Tornado
Hail	Typhoon
Hurricane	Weather Bureau
Monsoon	Whirlwind
Rain	Wind



STORY TELLING. Perhaps there is no combination of words which the average child uses oftener or speaks more eagerly than "Tell me a story." From the time the child is able to talk until long after he is well able to read stories for himself, mother, father, big sister hear the words over and over—"Tell me a story." There is a popular fallacy that anybody can tell a story; almost anybody will attempt to. But the results are often so confused, tedious and pointless that we can imagine that only because the need for a story is to the child a very pressing one would he accept such results.

We sometimes hear the words "the art of story telling," and the expression is none too strong. Story telling is an art, but that need not frighten anyone, for it is an art which anyone may master sufficiently well to make the telling of a story a pleasure to the one who does it as well as to the children who listen. There are no absolute rules to follow, but certain points must be kept in mind if the results are to be as satisfying as possible.

The Main Purpose of Story Telling. The first important point that needs consideration is the purpose of story telling; for only as the purpose is understood and accomplished can the success or failure of story telling be judged. If we ask a child why he demands stories so constantly, we shall without doubt receive some such reply as, "Because I like to hear them." And that is, after all, the real purpose—to give pleasure. If the story fails in this it fails in all. The art of story telling

is first, last and all the time an art of entertainment, and if it does not entertain it is no art.

Other Purposes. There are, to be sure, other values to story telling; it accomplishes certain things which, with the child, can be brought about in no other way. But these are secondary results, and are by no means to be attained without the primary one—the giving of pleasure.

One of the very practical results of story telling is that it encourages concentration. It will almost always be found that a child who is used to listening to poems or to stories hears better and more easily than a child who has not been so trained. Then, too, a child who has heard all his life good stories well told uses without effort words which are entirely foreign to the vocabulary of another child.

Some people object to having fairy stories told to children because they fear that the imagination may be overdeveloped. There is, however, little fear of this. There is far more danger that the imagination will be underdeveloped, and it is just this danger which the telling of wholesome stories helps to guard against.

One of the most important of all the benefits which a child may derive from listening to good stories is the broadening of his sympathies and comprehension. Most of us live but one kind of a life, and have little opportunity to come in touch with lives spent in totally different surroundings and under totally different circumstances. This has an inevitable narrowing tendency, and there is nothing which can so effectually offset this tendency as good stories which arouse interest in other lives, other conditions, other creatures, other lands.

Telling Stories Better than Reading. A person who feels no ability to tell stories is likely to think that reading aloud can supply the need; but anyone who has tried both knows that there is a great difference. The personal element is almost entirely lacking in reading aloud. The eyes of the reader cannot meet and hold the listener's eyes, and the child is far more likely to become restless and lose interest.

The Essentials of a Good Story. Even the most skilful of story tellers cannot make all stories interesting to children; widely as the different kinds of tales which are capable of interesting children differ, they all have some-

thing in common—there are certain qualities which a story must possess before it can ever be a favorite or even be tolerated.

First, it must have a definite beginning and a definite ending. No long introductory explanations are possible in a child's story; the action must begin at once. And the action must have worked itself out to its logical end before the story closes. The desire to make a story a "piece out of life" has led many writers of short stories for grown people to end their tales in the vaguest, most indefinite way; we do not know what really happened to the hero or heroine—we can only conjecture. But the child must know absolutely what happened, and if he can know that his story people were not only happy when the story closed but "lived happy ever after," so much the better.

Another requisite is that the story have action from first to last. Asides, moralizing, description, unless they are very brief, will not do. The characters must be moving, accomplishing something all the time.

The child's invariable desire for a happy ending to a story is simply an outgrowth of his feeling of justice. If the bad person is not punished and the good person rewarded, the child feels, the world is all wrong. As people grow older and see the many apparent failures of this principle of justice to work out, they accustom themselves to the same thing in literature; but the desire for a happy ending is innate in everyone, and it is seldom if ever that a child should be harrowed with a tale in which the hero or heroine comes to grief.

There is one point which everyone who has told stories to children must have noticed, and that is their fondness for certain little details which to an adult seem absolutely unessential. If there is a bit of color somewhere in a story, and it is left out in the fifth or the eighth or the tenth telling, the child misses it and feels disappointed. One woman declares that when she was a little girl the story of the Ugly Duckling never seemed quite the same to her if the old Spanish duck with the red rag around her leg was left out.

One device which is not really necessary in children's stories but which adds greatly to their attractiveness to the child mind is the repetition of certain words or phrases. This may take the form of a simple repetition of descriptive adjectives applied to a character, as the "little small wee bear" in the story of

the *Three Bears*, or it may be more elaborate—the repeating of several lines of a speech. Just why this makes so strong an appeal to children is not quite plain, but it is certain that it does so. One worker, who had had much experience telling stories to children, made systematic inquiries as to what stories children really like best, and discovered that the prime favorites were *The Three Bears*, *The Three Little Pigs* and *The Little Pig That Wouldn't Go Over the Stile*. Each of these stories has much repetition, and doubtless this fact has something to do with their popularity, though the stories have all of the characteristics of good children's stories.

How to Tell a Story. Now a story consists of the gathering up of one set of emotional events from a possible million. What makes a tale tedious? Trying to mention as many of the million as possible, instead of keeping to the one set. What makes it confused? Trying to give the events without keeping in mind that they are in one set—that is, related definitely to each other. What makes a story pointless? Forgetting that, as the set of events is emotional, it must lead to some climax, some happening or point.

Once we get the idea of what a story really is, and hold to it, we are pretty likely to find that we, too, can tell a story well, after a little practice. Your "natural" storyteller—the one who seems to have a veritable "gift" for telling stories to children—is keenly alive and constantly awake to what a story is, and because she is so, follows some such rules as these:

Know Your Story. Know it so well that you feel free while you are telling it—certain just where each point is to come in, and sure of your climax. A few stories well learned is a better plan than many imperfectly known and thus poorly told. Do not feel that a story must always be told in the same words. Probably it will not be told twice alike, for the circumstances of its telling are never twice the same. If, however, there are conversations or familiar passages or some of the repetitions of which children are so fond, they should not be changed.

Be Happy In It. Your enjoyment and appreciation will convey themselves to the children. "Teacher makes us all laugh when she tells *The Hare and the Tortoise*. We wish she'd tell it every day." No one can tell really well a story which seems to him pointless or foolish or uninteresting.

See As You Tell. Live over again the events of the narrative as you talk. Try to see the things happen, rather than to think overmuch about your words, and the story will unconsciously become vivid, dramatic and interesting.

Keep the Point in Mind. Let the story shape itself gradually, always with this one group of emotional events in mind. Don't drag in anything, however interesting, that is not closely connected with the business of the story. Let all you say illuminate your text in some way.

Telling "The Three Goats." The following story was told just as it is given here, by a teacher familiar with the principles of good story telling. Notice (1) her familiarity with it, (2) her own evident enjoyment of it, (3) its vividness and action, and (4) how all that is told helps on the movement of the tale. There is no attempt at moralizing, and yet how plainly the results of the various actions come out!

The Three Goats

Once upon a time there were three goats who were going to the green pasture across the river to eat, and eat, and eat, so that they would become very fat. They all three happened to be named "Gruff."

Now a great ugly troll lived under the bridge they had to cross to reach the green pasture. Ah, but he was a monster; his eyes were as big as plates and his wiggly nose as long as a hoe-handle!

The youngest goat Gruff stepped upon the bridge first.

"Trip trap! Trip trap!" whispered the bridge.

"Who is tripping over my bridge?" called the dreadful troll.

"Oh! it is only I, the very smallest of the goats Gruff."

"I'm coming to eat you up!" roared the troll.

"Please, please don't! I wouldn't make a mouthful for you. Wait till the second goat Gruff comes. He is much larger than I am."

"Trip on, then. I want a bigger mouthful," growled the troll.

Soon the second goat Gruff came along.

"Trip trap! Trip trap!" said the bridge.

"Who is tripping over my bridge?" called the dreadful troll.

"It is I, the second goat Gruff," said the goat in a voice like yours or mine.

"I'm coming to eat you up!" roared the troll.

"Please don't! I'm not very big. Wait till the third goat Gruff comes. He is much larger than I. He'd be well worth eating."

"Trip on, then. I want a very large meal," replied the ugly troll.

Very soon the big goat Gruff came.

"Trip trap!! Trip trap!!" called the bridge. It was ready to break with the weight.

"Who is stamping over my bridge?" called the dreadful troll.

"IT IS I, THE GREAT GOAT GRUFF!" called the largest goat in a voice as loud as the troll's.

"I'm coming to eat you up!" roared the troll. "HO! COME ON, THEN, COME!" roared the great goat Gruff.

And the troll came. The great goat Gruff butted him with his great horns and threw him into the river in a hundred pieces. He never ate up anyone again who tried to cross the bridge.

Then the three goats Gruff ate, and ate, and ate, in the green pasture. Unless they have stopped, they are eating there still.

Kinds of Stories. Almost any kind of a story provided it has action and a definite beginning and climax may be told so as to interest children, but there are certain kinds which seem of right to belong to the child. First of these, perhaps, is the fable. Even very young children like and can appreciate fables, and the endowing of animals with human characteristics is no strain on their imagination. (This subject is treated under LANGUAGE AND GRAMMAR, and a number of fables are there given.)

It is likely that if any group of children were asked what kind of stories they liked best the majority of them would say, without hesitation "fairy stories." By this they mean not only stories in which real fairies take a part, but any stories in which supernatural events occur. The introduction of the supernatural troubles them not at all. It is to them the one great essential that virtue should be rewarded and wickedness punished, and if the reward and punishment are dealt out by fairy godmothers, enchanted princesses, kings' sons who are disguised as animals, so much the better. And the most of the old fairy tales present to the child moral truths and give him lessons in kindness and industry which he could receive so acceptably in no other way.

The ancient myths, many of them, have that in them which appeals powerfully to children. These should, of course, to the young child be told simply as stories, with no intimation that he is being instructed in the religion and science of the world in its childhood days.

Humor is an element which is all too often absent from children's literature; and that children do enjoy it is shown by their appreciation of nonsense tales—tales which have in them little of story, but plenty of just that quality which appeals to children as "funny."

The nature story may be made very valuable, but the danger is always that it will be overdrawn; that the children will be given ideas of things in the world about them which are untrue. This does not mean that no tales should be told in which animals talk or show human characteristics; it does mean that care should be taken not to humanize too much the dog, the butterfly, the violet waking in the spring.

Historical tales and Bible tales, well told, never fail to interest children, and the lessons which they carry find their way into the minds of the little listeners without the necessity for emphasis on the moral.

A number of stories illustrating these different classes are given here, some of them, the real classics, being given just as they were written; others have been specially adapted for telling, for it is one of the essential points about story-telling that a story which is adapted for reading is very often not adapted for telling. Other stories are found in the KINDERGARTEN department of this work, and in the article BIBLE, while numerous fables and some story poems are included in the department of LANGUAGE AND GRAMMAR. Under MYTHOLOGY is to be found a representative collection of myths.

The Frog and the Ox

A FABLE

As an ox was grazing in a marshy meadow, he happened to set his foot on a family of young frogs, and trod almost the whole of them to death. One, however, escaped, and telling his mother of the sad fate of the rest of her family, he said, "And mother, it was such a big beast! I never saw such a large one in my life."

"Was it as large as this?" said the old frog blowing her self as much as possible. "Oh!" said the little one, "a great deal bigger, mother." "Well, was it as big as this?" and she puffed out her speckled skin still more. "O mother, it is no use your trying to make yourself as big as it, for were you even to burst yourself you would not be near its size." The mother frog was much annoyed at this remark: so she once more tried to increase her size, and she burst herself indeed.

MORAL—Do not covet that which is beyond your reach.

The Donkey in the Lion's Skin

A FABLE

A donkey, having found the skin of a lion, put it on, and, going into the fields, amused himself by frightening all the animals he met. Seeing a fox, he tried to alarm him also. But Reynard, perceiving his long ears sticking out, and hearing his voice, at once knew who it was. "Ah!" said he, "I should have been frightened too, if I had not heard you bray."

MORAL—It is not wise to judge a man by the coat he wears.

Frau Holle

A FAIRY TALE

There was once a widow who had two daughters; one was as pretty as could be, and worked hard for her living; the other was ugly and idle.

Now, it chanced that the widow loved the ugly daughter better than the pretty one, because she was her very own, whilst the pretty maiden was only her step-daughter. So, besides doing all the work of the house, the poor girl was sent every day to sit beside the village well and spin a bundle of flax into yarn. Sometimes she had to work so hard that her poor little fingers were covered with blood;

and when she came to herself again she found that she had fallen into a beautiful meadow, decked with every sweet and lovely flower, where the sun was shining brightly.

As she strolled along the meadow path, she came to an oven full of bread. "Take us out! take us out! or we shall burn," cried the loaves; "we are just baked enough."

So the girl opened the oven door and took out the bread and then went on her way again. Presently she came to an apple-tree weighed down with fruit, and it called to her as she passed: "Shake me! shake me! My apples are all ripe." So she shook the apple-tree till the apples fell like rain around her. When there were no more left upon the tree, she stacked them in heaps, and went her way.



THE FEATHERS FLEW LIKE
SNOWFLAKES

and one day, when this happened, and a few drops of blood had fallen upon the spindle, she bent over the well to wash it clean again, and dropped it in.

She ran weeping to her step-mother, to tell her what had happened, and the angry woman scolded her without mercy. "As you have let the spindle fall in," said she, "you must just go and fetch it out again."

So the poor little maid went back to the well, and in her sorrow and despair, she jumped straight into it, to see if she could find her spindle. At once she lost all con-

sciousness, and when she came to herself again she found that she had fallen into a beautiful meadow, decked with every sweet and lovely flower, where the sun was shining brightly. At length she reached a little house, where an old woman was looking out of the window. The girl was afraid of her great big teeth, and would have run away, but she called to her: "Do not be afraid of me, dear child; I am Frau Holle. Stay with me, and help me with the housework. If you are a good girl, all shall go well with you. But you must take great pains to shake up my bed and make the feathers fly, or else there will be no snow to cover up the earth."

The old woman spoke so kindly that the girl took courage and agreed to stay with her.

She worked as hard as she was able, and pleased the old woman in everything she did. She shook the bed with such a will that the feathers flew like snow-flakes. So she led a happy life, with never an unkind word to grieve her, and had boiled and baked meats to eat every day. Time passed on, and the little maid grew pale and sad, though she herself could not tell at first what ailed her. At length she thought it must be homesickness, for, although she was treated a thousand times better than ever she had been at home, she had a great longing to go back again. So she went to the old woman and told her how she felt.

"I have been very happy here," she said; "but I have such a longing to see my own people once again that I can stay here no longer."

"It is right you should wish to go home, my child," answered Frau Holle. "You have served me faithfully all this long time, so I will see that you have a safe journey back."

She took the girl by the hand and led her to a great gate, which stood wide open. As soon as she passed through, a shower of golden rain fell and covered her with glittering gold from head to foot, so that she looked as though she was clad in a golden mantle. "That is my gift to you, because you have been a good, hard-working girl," said Frau Holle, and then gave her as well, the spindle which she had let fall into the well so long ago.

Immediately afterward the gate shut with a clang, and the girl found herself back in the world once more, and quite near to her mother's house. As she entered the courtyard, the cock began to crow:

"Cock-a-doodle-doo-doo-doo!
The golden girl's come back to you!"

Then the little maid went in to her mother and sister, who made a great fuss over her, now that she had come home covered with gold.

She told them all that had happened, and when the mother heard how her pretty daughter had come by her fortune, she was anxious that her ugly daughter should have the same good luck. So she sent her to sit by the side of the well, and put a spindle into her hand. The lazy girl had never pricked her fingers with spinning, but she thrust her hand into a thorn-bush, so that it might look as though she had.

Then she threw the spindle into the well, and jumped in after it.

She fell just as her sister had done, into a beautiful flowery meadow, and followed the same path.

When she came to the oven, the bread cried out as before: "Take us out, or we shall burn. We are just baked enough."

The lazy girl answered: "I am not going to soil my hands for you."

Soon she came to the apple-tree. "Shake me! shake me; My apples are all ripe," it cried.

But the girl tossed her head and went on her way. "If I were to shake you," she said

scornfully, I might get a bump on my head from one of you for my pains."

When she reached Frau Holle's house she saw her looking out of the window, but was not in the least afraid of her, because she had heard beforehand of her large teeth. She engaged herself to the old woman, and at first things went very well. She remembered the gold she would receive at the end of her service and did her work as well as she was able.

But very soon she grew lazy, and would not get up in the mornings. Then too, she neglected Frau Holle's bed shamefully, and scarcely shook it at all, so that there was not a feather to be seen. So her mistress soon tired of her, and told her to go home.

Miss Lazybones was delighted, for she thought the time had now come for the shower of gold but when Frau Holle led her beneath the great gateway, instead of gold there fell a shower of pitch. "This is the reward for your services," said the old woman, and banged the door behind the idle girl.

And so, when she reached home, covered with pitch, and as black as a sweep, the cock, perched on the wall beside the well, began to crow:

"Cock-a-doodle-doo-doo-doo!
Your dirty girl's come back to you!"

And dirty the girl remained all the days of her life, for, try as much as she would, she could never wash the pitch off again.

This is one of the tales that has a very plain moral—so plain that it need not be pointed out to the youngest child. Even children sometimes object to the "goody-goody," "Sunday School" stories with their obvious lessons; but the wonder element in this story, the striking character of the reward and the punishment make the story very attractive to children.

The Little Pig that wouldn't go over the Stile A NONSENSE TALE

One day, as a little old woman was sweeping her little house, she found a crooked sixpence, and she said, "I will go to the market and buy a little pig with this crooked sixpence."

So she did, and as she was coming home she came to a stile.

"Little pig, little pig, go over the stile," said the little old woman; but the little pig would not.

She went a little farther and met a dog, and she said: "Dog, dog, bite pig; pig won't go over the stile, and I shall not get home tonight." But the dog would not.

She went a little farther and met a stick and she said: "Stick, stick, beat dog; dog won't bite pig; pig won't go over the stile, and I shall not get home tonight." But the stick would not.

She went a little farther, and she met a fire. So she said:

"Fire, fire, burn stick; stick won't beat dog; dog won't bite pig; pig won't get over the stile; and I shall not get home tonight." But the fire would not.

She went a little farther, and she met some water. So she said: "Water, water, quench fire; fire won't burn stick; stick won't beat dog; dog won't bite pig; pig won't get over the stile; and I shall not get home tonight." But the water would not.

She went a little farther, and she met an ox. So she said: "Ox, ox, drink water; water won't quench fire; fire won't burn stick; stick won't beat dog; dog won't bite pig; pig won't get over the stile; and I shall not get home tonight." But the ox would not.

She went a little farther and she met a butcher. So she said: "Butcher, butcher, kill ox; ox won't drink water; water won't quench fire; fire won't burn stick; stick won't beat dog; dog won't bite pig; pig won't get over the stile; and I shall not get home tonight." But the butcher would not.

She went a little farther, and she met a rope. So she said: "Rope, rope, hang butcher; butcher won't kill ox; ox won't drink water; water won't quench fire; fire won't burn stick; stick won't beat dog; dog won't bite pig; pig won't get over the stile; and I shall not get home tonight." But the rope would not.

milk, I will kill the rat." So away went the old woman to the cow.

But the cow said to her, "If you will go to yonder hay-stack, and fetch me a handful of hay, I'll give you the milk." So away went the old woman to the hay-stack; and she brought the hay to the cow.

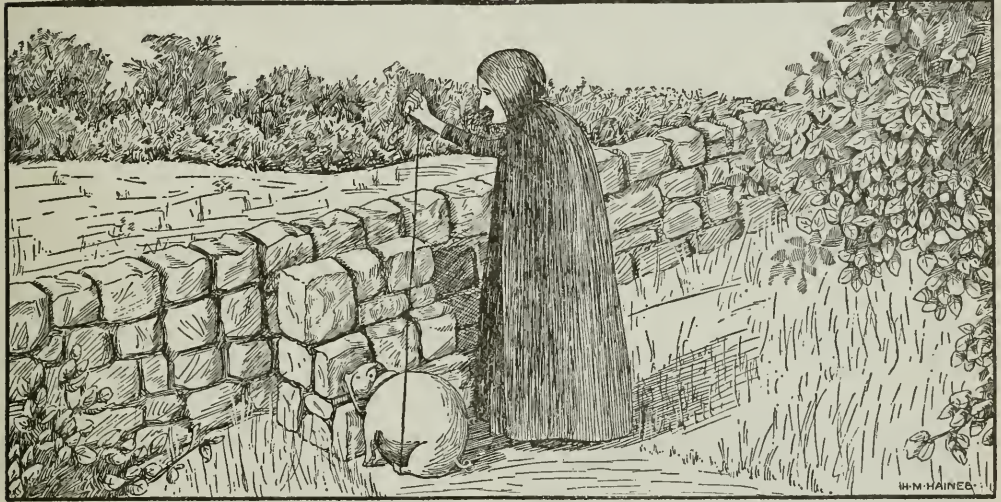
As soon as the cow had eaten the hay, she gave the old woman the milk; and away she went with it in the saucer to the cat.

As soon as the cat had lapped up the milk, the cat began to kill the rat; the rat began to gnaw the rope; the rope began to hang the butcher; the butcher began to kill the ox; the ox began to drink the water; the water began to quench the fire; the fire began to burn the stick; the stick began to beat the dog; the dog began to bite the pig; the little pig jumped over the stile; and so the old woman got home that night.

The Ugly Duckling

A NATURE STORY

It was glorious in the country; it was summer; the cornfields were yellow, the oats were green, the hay had been put up in stacks in the



"LITTLE PIG, LITTLE PIG, GO OVER THE STILE."

She went a little farther, and she met a rat. So she said: "Rat, rat, gnaw rope; rope won't hang butcher; butcher won't kill ox; ox won't drink water; water won't quench fire; fire won't burn stick; stick won't beat dog; dog won't bite pig; pig won't get over the stile; and I shall not get home tonight." But the rat would not.

She went a little farther, and she met a cat. So she said: "Cat, cat, kill rat; rat won't gnaw rope; rope won't hang butcher; butcher won't kill ox; ox won't drink water; water won't quench fire; fire won't burn stick; stick won't beat dog; dog won't bite pig; pig won't get over the stile; and I shall not get home tonight." But the cat said to her, "If you will go to yonder cow, and fetch me a saucer of

green meadows; and the stork went about on his long red legs, and chattered Egyptian, for this was the language he had learned from his mother. All around the fields and meadows were great woods, and in the midst of these woods deep lakes. Yes, it was right glorious in the country.

In the midst of the sunshine there lay an old farm, with deep canals about it; and from the wall down to the water grew great burdocks, so high that little children could stand upright under the tallest of them. It was just as wild there as in the deepest wood, and here sat a Duck upon her nest; she had to hatch her ducklings; but she was almost tired out before the little ones came; and she seldom had visitors. The other ducks liked better to swim

about in the canals than to run up to sit under a burdock, and gabble with her.

At last one egg-shell after another burst open. "Pip! pip!" each cried, and in all the eggs there were little things that stuck out their heads.

"Quack! quack!" said the Duck, and they all came quacking out as fast as they could, looking all around them under the green leaves; and the mother let them look as much as they liked, for green is good for the eye.

"How wide the world is!" said all the young ones; for they certainly had much more room now than when they were inside the eggs.

"D'ye think this is all the world?" said the mother. "That stretches far across the other side of the garden, quite into the parson's field; but I have never been there yet. I hope you are all together," and she stood up. "No, I have not all. The largest egg still lies there. How long is that to last? I am really tired of it." And so she sat down again.

"Well, how goes it?" asked an old Duck who had come to pay her a visit.

"It takes a long time for this one egg," said the Duck who sat there. "It will not open. Now, only look at the others! They are the prettiest little ducks I ever saw. They are all like their father: the rogue, he never comes to see me."

"Let me see the egg which will not burst," said the old Duck. "You may be sure it is a turkey's egg. I was once cheated in that way, and had much care and trouble with the young ones, for they are afraid of the water. Must I say it to you? I could not make them go in. I quacked, and I clacked, but it was no use. Let me see the egg. Yes, that's a turkey's egg. Let it lie there, and do you teach the other children to swim."

"I think I will sit on it a little longer," said the Duck. "I've sat so long now that I can sit a few days more."

"Just as you please," said the old Duck; and she went away.

At last the great egg burst. "Pip! pip!" said the little one, and crept forth. He was so big and ugly. The Duck looked at him.

"It's a very large Duckling," said she. "None of the others looks like that; it really must be a turkey chick! Well, we shall soon find out. Into the water shall we go, even if I have to push him in."

The next day it was bright, beautiful weather; the sun shone on all the green burdocks. The Mother-Duck with all her family went down to the canal. Splash! she jumped into the water. "Quack! quack!" she said, and one duckling after another plumped in. The water closed over their heads, but they came up in an instant, and swam off finely; their legs went of themselves, and they were all in the water; even the ugly gray Duckling swam with them.

"No, it's not a turkey," said she; "look how well he uses his legs, how straight he holds himself. It is my own child! On the whole he's quite pretty, when one looks at him rightly. Quack! quack! come now with me, and I'll lead you out into the world, and present you in

the duck-yard; but keep close to me all the time, so that no one may tread on you, and look out for the cats."

And so they came into the duck-yard. There was a terrible row going on in there, for two families were fighting about an eel's head, and so the cat got it.

"See that's the way it goes in the world!" said the Mother-Duck; and she whetted her beak, for she too wanted the eel's head. "Only use your legs," she said. "See that you can bustle about, and bend your necks before the old Duck yonder. She's the grandest of all here, she's of Spanish blood—that's why she's so fat; and do you see? she has a red rag around her leg; that's something very, very fine, and the greatest mark of honor a duck can have: it means that one does not want to lose her, and that she's known by the animals and by men too. Hurry! hurry!—don't turn in your toes; a well-brought-up duck turns its toes quite out, just like father and mother—so! Now bend your necks and say 'Quack!'"

And they did so: but the other ducks round about looked at them, and said quite boldly:

"Look there! now we're to have this crowd too! as if there were not enough of us already! And—fie!—how that Duckling yonder looks; we won't stand that!" And at once one duck flew at him, and bit him in the neck.

"Let him alone," said the mother; "he is not doing anything to anyone."

"Yes, but he's too large and odd," said the Duck who had bitten him, "and so he must be put down."

"Those are pretty children the mother has," said the old Duck with the rag round her leg. "They're all pretty but that one; that is rather unlucky. I wish she could have that one over again."

"That cannot be done, my lady," said the Mother-Duck. "He is not pretty, but he has a really good temper, and swims as well as any of the others; yes, I may even say it, a little better. I think he will grow up pretty; perhaps in time he will grow a little smaller; he lay too long in the egg, and therefore he has not quite the right shape. And she pinched him in the neck, and smoothed his feathers. "Besides, he is a drake," she said, "and so it does not matter much. I think he will be very strong; he makes his way already."

"The other ducklings are graceful enough," said the old Duck. "Make yourself at home; and if you find an eel's head, you may bring it to me."

And now they were at home. But the poor Duckling who had crept last out of the egg, and looked so ugly, was bitten and pushed and made fun of, both by the ducks and chickens.

"He is too big!" they all said. And the turkey-cock, who had been born with spurs, and so thought he was an emperor, blew himself up, like a ship in full sail, and bore straight down upon him; then he gobbled and grew quite red in the face. The poor Duckling did not know where he dared stand or walk; he was quite unhappy because he looked ugly, and was the sport of the whole duck-yard.

So it went on the first day; and then it grew worse and worse. The poor Duckling was hunted about by everyone; even his brothers and sisters were quite angry with him, and said, "If the cat would only catch you, you ugly creature!" And the ducks bit him and the chickens beat him, and the girl who had to feed the poultry kicked at him with her foot.

Then he ran and flew over the fence, and the little birds in the bushes flew up in fear.

"That is because I am so ugly!" thought the Duckling; and he shut his eyes, but flew on farther; and so he came out into the great moor, where the wild ducks lived. Here he lay the whole night long, he was so tired and sad.

Toward morning the wild ducks flew up, and looked at their new mate.

"What sort of a one are you?" they asked; and the Duckling turned about to each, and bowed as well as he could. "You are really very ugly!" said the Wild Ducks. "But that is all the same to us, so long as you do not marry into our family."

Poor thing! he certainly did not think of marrying, and only dared ask leave to lie among the reeds and drink some of the swamp water.

There he lay two whole days; then came thither two wild geese, or more truly, two wild ganders. It was not long since each had crept out of an egg, and that's why they were so saucy.

"Listen, comrade," said one of them. "You're so ugly that I like you. Will you go with us, and become a bird of passage? Near here is another moor, where are a few sweet lovely wild geese, all unmarried, and all able to say 'Quack!' You've a chance of making your fortune, ugly as you are."

"Piff! paff!" sounded through the air; and both the ganders fell down dead in the reeds, and the water became blood red. "Piff! paff!" it sounded again, and the whole flock of wild geese flew up from the reeds. And then there was another report. A great hunt was going on. The gunners lay around in the moor, and some were even sitting up in the branches of the trees, which spread far over the reeds. The blue smoke rose like clouds in among the dark trees, and hung over the water; and the hunting dogs came—splash, splash!—into the mud, and the rushes and reeds bent down on every side. That was a fright for the poor Duckling! He turned his head to put it under his wing; and at that very moment a frightful great dog stood close by the Duckling. His tongue hung far out of his mouth, and his eyes glared horribly. He put his nose close to the Duckling, showed his sharp teeth, and—splash, splash!—on he went without seizing it.

"Oh, Heaven be thanked!" sighed the Duckling. "I am so ugly that even the dog does not like to bite me!"

And so he lay quite quiet, while the shots rattled through the reeds and gun after gun was fired. At last, late in the day, all was still; but the poor little thing did not dare to rise up; he waited several hours still before he looked around, and then hurried away out of the moor as fast as he could. He ran on

over field and meadow; there was a storm, so that he had hard work to get away.

Towards evening the Duckling came to a peasant's poor little hut; it was so tumbled down that it did not itself know on which side it should fall; and that's why it stood up. The storm whistled around the Duckling in such a way that he had to sit down to keep from blowing away; and the wind blew worse and worse. Then he noticed that one of the hinges of the door had given way, and the door hung so slanting that he could slip through the crack into the room; and that is what he did.

Here lived an old woman, with her Cat and her Hen. And the Cat, whom she called Sonnie, could arch his back and purr; he could even give out sparks; but for that, one had to stroke his fur the wrong way. The Hen had quite small, short legs, and therefore she was called Chickabiddy Shortshanks; she laid good eggs, and the woman loved her.

In the morning they noticed at once the strange Duckling, and the Cat began to purr and the Hen to cluck.

"What's this?" said the woman, and looked all around; but she could not see well, therefore she thought the Duckling was a fat duck that had strayed. "This is a rare prize!" she said. "Now I shall have duck's eggs. I hope it is not a drake. We must try that."

And so the Duckling was taken on trial for three weeks, but no eggs came. And the Cat was master of the house, and the Hen was the lady, and always said "We and the world!" for they thought they were half the world, and by far the better half. It seemed to the Duckling that one might have another mind, but the Hen would not allow it.

"Can you lay eggs?"

"No."

"Then will you hold your tongue!"

And the Cat said, "Can you curve your back, and purr, and give out sparks?"

"No."

"Then you will please have no opinion of your own when sensible folks are speaking!"

And the Duckling sat in a corner and was in low spirits; then he began to think of the fresh air and the sunshine; and he was seized with such a strange longing to swim on the water, that he could not help telling the Hen of it.

"What are you thinking of?" cried the Hen. "You have nothing to do, that's why you have these fancies. Lay eggs, or purr, and they will pass over."

"But it is so charming to swim in the water," said the Duckling, "so nice to feel it go over one's head, and to dive down to the bottom!"

"Yes, that's a fine thing, truly," said the Hen. "You are clean gone crazy. Ask the Cat about it—he's the cleverest thing I know—ask him if he likes to swim in the water, or to dive down: I won't speak about myself. Ask our mistress herself, the old woman; no one in the world knows more than she. Do you think she wants to swim, and to let the water close above her head?"

"You don't understand me," said the Duckling.

"We don't understand you! Then pray who is to understand you? You surely don't pretend to be cleverer than the Cat and the woman—I won't say anything of myself. Don't make a fool of yourself, child, and thank your Maker for all the good you have. Are you not come into a warm room, and have you not folks about you from whom you can learn something? But you are a goose, and it is not pleasant to have you about. You may believe me, I speak for your good. I tell you things you won't like, and by that one may always know one's true friends! Only take care that you learn to lay eggs, or to purr, and to give out sparks."

"I think I will go out into the wide world," said the Duckling.

"Yes, do go," replied the Hen.

And so the Duckling went away. He swam on the water, and dived, but he was shunned by every creature because he was so ugly.

Now came the fall of the year. The leaves in the wood turned yellow and brown; the wind caught them so that they danced about, and up in the air it was very cold. The clouds hung low, heavy with hail and snow-flakes, and on the fence stood the raven, crying, "Croak! croak!" for mere cold; yes, one could freeze fast if one thought about it. The poor little Duckling certainly had not a good time. One evening—the sun was just going down in fine style—there came a whole flock of great handsome birds out of the bushes; they were shining white, with long, supple necks; they were swans. They uttered a very strange cry, spread forth their glorious great wings, and flew away from that cold region to warmer lands, to fair open lakes. They mounted so high, so high! and the ugly Duckling had such a strange feeling as he saw them! He turned round and round in the water like a wheel, stretched out his neck towards them, and uttered a cry, so high, so strange, that he feared as he heard it. Oh! he could not forget those beautiful, happy birds; and as soon as he could see them no longer, he dived down to the very bottom, and when he came up again, he was quite beside himself. He did not know what the birds were, nor where they were flying to; but he loved them more than he had ever loved anyone. He did not envy them at all. How could he think of wishing to have such loveliness as they had? He would have been glad if only the ducks would have let him be among them—the poor, ugly creature!

And the winter grew so cold, so cold! The Duckling had to swim about in the water, to keep it from freezing over, but every night the hole in which he swam about became smaller and smaller. It froze so hard that the icy cover sounded; and the Duckling had to use his legs all the time to keep the hole from freezing tight. At last he became worn out, and lay quite still and thus froze fast in the ice.

Early in the morning a peasant came by, and found him there; he took his wooden shoe, broke the ice to pieces, and carried the Duckling home to his wife. Then the Duckling came to himself again. The children wanted

to play with him; but he thought they wanted to hurt him, and in his terror he flew up into the milk-pan, so that the milk spilled over into the room. The woman screamed and shook her hand in the air, at which the Duckling flew down into the tub where they kept the butter, and then into the meal-barrel and out again. How he looked then! The woman screamed, and struck at him with the fire tongs; the children tumbled over one another as they tried to catch the Duckling; and they laughed and they screamed!—well was it that the door stood open, and the poor creature was able to slip out between the bushes into the newly-fallen snow. There he lay quite worn out.

But it would be too sad if I were to tell all the misery and care which the Duckling had to bear in the hard winter. He lay out on the moor among the reeds, when the sun began to shine again and the larks to sing; it was a beautiful spring.

Then all at once the Duckling could flap his wings: they beat the air more strongly than before, and bore him stoutly away; and before he well knew it, he found himself in a great garden, where the elder-trees stood in flower and bent their long green branches down to the winding canal, and the lilacs smelt sweet. Oh, here it was beautiful, fresh, and spring-like! and from the thicket came three glorious white swans; they rustled their wings, and sat lightly on the water. The Duckling knew the splendid creatures, and felt a very strange sadness.

"I will fly away to them, to the royal birds! and they will beat me, because I, that am so ugly, dare to come near them. But it is all the same. Better to be killed by them than to be chased by ducks, and beaten by fowls, and pushed about by the girl who takes care of the poultry-yard, and to suffer hunger in winter!" And he flew out into the water, and swam toward the beautiful swans: these looked at him, and came sailing down upon him with outspread wings. "Kill me!" said the poor creature, and bent his head down upon the water, and waited for death. But what saw he in the clear water? He saw below him his own image; and, lo! it was no longer a clumsy dark-gray bird, ugly and hateful to look at, but—a swan!

It matters nothing if one is born in a duck-yard, if one has only lain in a swan's egg.

He felt quite glad at all the need and hard times he had borne; now he could joy in his good luck in all the brightness that was round him. And the great swans swam round him and stroked him with their beaks.

Into the garden came little children, who threw bread and corn into the water; and the youngest cried, "There is a new one!" and the other children shouted, "Yes, a new one has come!" And they clapped their hands and danced about, and ran to their father and mother; and bread and cake were thrown into the water; and they all said, "The new one is the most beautiful of all! so young and so handsome!" and the old swans bowed their heads before him.



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HE WAS NO LONGER A CLUMSY, DARK-GRAY BIRD, BUT—A SWAN!

Then he felt quite ashamed and hid his head under his wings, for he did not know what to do; he was so happy, and yet not at all proud, for a good heart is never proud. He thought how he had been driven about and mocked and despised; and now he heard them all saying that he was the most beautiful of all beautiful birds. And the lilacs bent their branches straight down into the water before him, and the sun shone warm and mild. Then his wings rustled, he lifted his slender neck, and cried from the depths of his heart:

"I never dreamed of so much happiness when I was the Ugly Duckling."

We are not accustomed to thinking of this as a nature study, but it has all the elements of the nature tales which modern writers of stories for children produce in such abundance. The emphasis, to be sure, is on the *human* side of the animal characters; but the other side is not neglected. As we read the ugly duckling seems to us like a person, but he also seems like a duckling. The attitude of the other ducks toward the ugly duckling, who is near enough like them not to seem a stranger, and yet not exactly one of themselves; the instinct which makes the duckling, all unconscious that he is himself a swan, cry out when he sees the other swans; the instinct which keeps the hunter's dog, trained to pick up dead geese, from touching the live swan—all these are true to nature.

The lesson of the story, which is very plain, is a most beautiful one, and one which parents and teachers cannot afford to miss. There is many a child, awkward, conscious, large for his age, who is mistreated, laughed at, sometimes even abused, just because he is not like other children. And then, perhaps, later it is found to be just a repetition of the story of the ugly duckling; the child did not seem like other children because he was not like other children. He was something bigger, stronger, more beautiful than they, and for that reason it took him longer to develop.

We might read over and over some such statement as this: "Just because a child is different from others, just because he is not attractive as a child, we cannot judge what he will be as a man. Perhaps he will amount to more in the end than all of his normal associates." But would such a statement make much impression on us? When we read *The Ugly Duckling*, however, we find it impossible to forget the lesson it teaches, and we find ourselves more ready to say, when we see a misjudged child, "Look out. He *may* turn out to be a real ugly duckling."

The Gifts the Dwarfs Made

A NORSE MYTH RETOLD FOR CHILDREN

This is a story about dwarfs, little dark men who lived far down under ground and made wonderful things.

Sif, Thor's wife, was most beautiful, with her blue eyes, fair skin, and golden hair. Her hair! It was the most glorious hair that had ever grown on anyone's head—bright and soft and fine, and so long and heavy that when she let it down it covered her from head to foot like a golden veil. Of course she was very proud of it, and of course Thor was proud of it too and loved to watch her shake it out so that it shone and rippled like a golden waterfall in the sun.

One morning when she woke, Sif found that her hair had been cut off close to her head. A look into her polished silver mirror showed her that the most of her beauty had gone with her hair, and she scarcely dared face her husband; but when she told Thor his anger was terrible to behold.

"It is Loki, the wicked Loki, who has done this," he cried, "and he shall suffer for it."

For Loki was a crafty schemer, always trying to annoy someone, and particularly fond of troubling Thor.

It was no easy task for Thor to catch the thief, for Loki had the power of changing his shape to that of anything he chose, and he made good use of his power now. Finally, however, Thor found him and grabbed him by the throat.

"Confess," he cried, "that you stole Sif's hair."

But his grip was so strong that Loki could only gasp and wriggle.

"Unless you give it back," Thor continued, "I shall kill you here and now," and he loosened his grasp that Loki might answer.

"I did it," confessed Loki sullenly, "but I cannot give it back, for I opened my hands and scattered it all over the earth."

"Then you shall die!" thundered Thor, and would have kept his word had not Loki promised to get for Sif a new head of hair as beautiful as the first.

"Go then," commanded Thor, "and make haste."

Loki slunk away and crept into the earth where lived his friends the dwarfs. They were ugly and not always very pleasant, but Loki knew their skill and knew that they were proud to be called on to show it. So he implored them to make for him not only the golden hair, but gifts for Odin and Frey, Thor's powerful friends of whose anger Loki was afraid.

To anyone else it might have seemed like a very difficult matter to have to make a head of golden hair, but the dwarfs thought nothing of it. They brought their gold, and when they had softened it they spun it out into countless fine hairs. These they braided into a huge coil and gave to Loki.

"It may seem dead now," said the master-smith, "but when it touches Sif's head it will at once become alive and begin to grow, yet it will always be real gold."

Wonderful as this was it was not the most wonderful of the dwarfs' gifts. For how could anything be as wonderful as the spear which they made for Odin, the spear which however it was thrown never missed its aim; or as the ship which they made for Frey? For this ship, while it could be folded up and thrust into the pocket, could be made so large that hundreds of people might ride in it in comfort, and it sailed as well in the air as on the water and always in just the right direction, no matter which way the wind blew.

No wonder Loki was pleased, and no wonder he cried aloud to the master-smith:

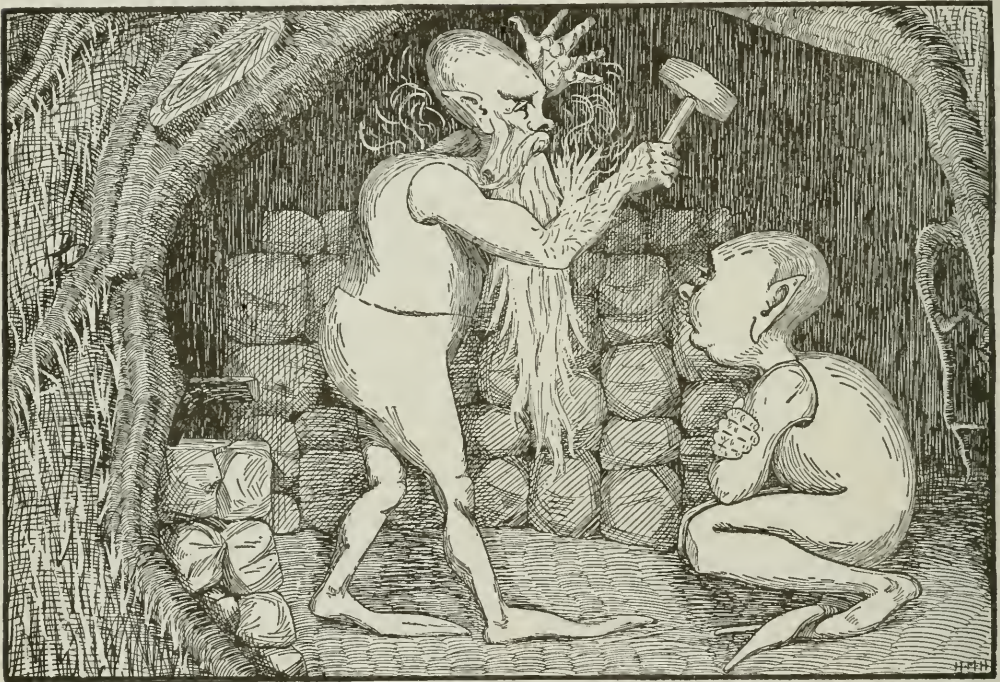
"You are surely the most clever smith in all the world. No one else, I am sure, could make such things."

But someone was passing and heard these words and was not pleased to hear them; this was the dwarf Brock, who belonged to a dif-

ferent family of dwarfs. Without a word Brock turned and hurried to his brother's smithy, where he told his story; and Sindri, proud of his brother's faith in him, at once set to work. But first he said to Brock:

"You must blow the bellows while the gifts are being made, for I must go outside and work my magic spells or I shall not be able to accomplish anything wonderful; and whatever happens never leave off blowing the bellows." And with these words he tossed into the fire a pig's skin, and thrusting the bellows into Brock's hands left the smithy.

Now Loki, for all his boastful words, was a little bit worried, and to be on the safe side he came to Sindri's smithy to see what was going on there. But Brock did not see him—Loki was not so foolish as to let himself be seen. He turned himself into a gadfly, and settling on Brock's hand, stung him until the pain was



IN THE DWARFS' SMITHY

ferent family of dwarfs. When he heard the flattering words of Loki, whom he hated, he stopped and said:

"I do not know what your gifts are, but I know that whatever they are my brother Sindri can make something more wonderful."

"Let us make it a wager," cried Loki. "I will meet you tomorrow in Odin's great hall, and you may bring with you there three things made by your brother to present to Thor and Odin and Frey, and then we shall see what we shall see. And whichever one of us brings the most wonderful gifts shall have the other's head."

almost unendurable. But Brock blew the bellows and blew the bellows and never left off for a minute. When Sindri came back he said: "Good brother;" and he drew out of the fire a boar with shining bristles of gold.

Next he threw into the fire some gold, and warning Brock once more to be careful never to cease blowing the bellows, he again left the smithy. This time Loki settled on Brock's cheek and stung even more sharply than before, so that the poor little dwarf had to set his teeth hard to endure the pain. But still he never left off blowing the bellows, and when Sindri came back, there was found in

the fire, instead of the lump of gold that had gone in, a heavy ring of gold, carved most beautifully.

"Once more," said Sindri, as he threw a lump of iron into the fire; "and this time be extra careful about the bellows." Brock turned to work bravely, but the gadfly Loki settled just over his eye, and stung him so fiercely that the blood ran down into his eyes so that he could not see what he was doing. The pain would never have made him stop, but he just had to put up his hand and wipe the blood from his eye, and at that moment Sindri entered the room.

"You have spoiled it!" he cried, as he sprang toward the fire; but when he drew out the heavy hammer to which the lump of iron had been changed, he comforted Brock by telling him that it was not entirely spoiled—"only the handle is too short," he added.

"Loki declared," said Brock, "that his gifts were not only beautiful and useful, but that they were magic gifts and could do wonderful things."

Sindri smiled, then whispered something in Brock's ear which made the little dwarf's eyes shine.

The next day he was at Odin's hall promptly at the appointed time, and he stood patiently by while Loki gave his gifts.

"It is even more beautiful than the old hair," declared Thor, as Sif shook out above herself the new golden threads.

"And such a spear!" cried Odin. "No enemy will ever be able to stand against me now."

"But mine is best," said Frey, "for we can all use it. Come," he went on, turning to the crowd which had assembled, "let's go for a ride in this wonderful new ship."

"Wait," cried Brock, "I have something, too, to offer."

"What, more gifts?" exclaimed Odin. "Of course we will wait."

But he looked a little disappointed when Brock put into his hand the heavy gold ring, for he had rings a-plenty, some of them as beautiful as this one.

"It is a magic ring," said Brock; "every ninth night, eight rings as large and heavy as this one will drop from it. That one ring alone would make a person rich."

Then he pulled from his huge sack the golden boar, glittering in the sunlight.

"It is named Gullinbursti," said Brock to Frey, "and it is a magic boar. On his back you can ride through the air as fast as a thought can fly, and even in the darkest night it need never be dark to you, for the bristles of Gullinbursti will give out light as he flits across the sky."

"I like him even better than the ship," said Frey; and Odin, who had been looking at his two gifts in silence, now said:

"And I like the ring better than the magic spear."

Brock grew more and more cheerful, and Loki's frown grew blacker and blacker, but he smiled again when Brock drew out and handed to Thor, the ugly, short-handled hammer. Thor himself looked none too well

pleased. Was the dwarf making fun of him? Hammers of this sort were to be had any day for the asking.

"But it is a magic hammer," exclaimed Brock. "It hits anything at which it is thrown and it never hits in vain. The strongest mountain will split, the strongest giant will die at a stroke of this hammer, and no matter how far it is thrown it will always fly back to your hand."

At the word "giant," Thor's look of displeasure changed. For were not the giants, the huge, ugly frost-giants, his worst enemies? And had he not always, up to this time, tried in vain to overcome them?

"Sif's hair is beautiful," he said, looking at his wife with pride in his eyes, "and the hammer is not beautiful, but I like the hammer better."

"Brock has won! Brock has won!" cried the crowd, who had heard of the wager and were none too fond of Loki, "and he may have Loki's head."

Brock turned for vengeance on Loki, but Loki had disappeared.

"I gave you the hammer; you will help me to find him," said the dwarf to Thor, and because he hated Loki and was grateful to Brock, Thor soon brought Loki back.

"You may take my head," said Loki; "it is yours by the terms of our wager. But if you touch my neck, or spill one drop of my blood, you will be taking more than belongs to you, and you must die."

"I'm afraid that is right," said Thor, and Brock was in despair.

But at last he decided that if he could not have Loki's head he would at least sew up his lying, boastful mouth; so he borrowed an awl from his brother Sindri, made holes through Loki's lips, and fastened them together with a leather thong.

And so for a while there was peace, because Loki could not make trouble with his tongue. But it was not for long. Loki managed to cut the cord and was soon going about making trouble just as he had always done.

The Story of Arnold Winkelried

There have been brave men in every age and in every country, but there have been few braver than Arnold Winkelried, who was not a king, not a general at the head of his troops, but just a poor Swiss peasant.

Over five hundred years ago, the little cantons of Switzerland had banded together and were making a desperate struggle for liberty; for the rulers of Austria, who ruled Switzerland too, oppressed the Swiss people terribly and gave them no rights of any sort.

At last in the summer of 1386, a great battle took place. The Austrian army, led by Duke Leopold, had four thousand horsemen and fourteen hundred foot soldiers, while the Swiss army had only thirteen hundred men altogether.

The Swiss are a brave people and the difference in the strength of the forces did not daunt them; but when they came to the actual conflict it seemed as if there were no way to be-

gin the attack. The Austrian army looked like a wall, but a wall which bristled with spear-points. Nowhere could the Swiss find or make an opening, and until they could, they knew that they should hurl themselves in vain on their enemies.

In the front rank of the Swiss there was one man, Arnold Winkelried, who was even braver than his comrades. His quick eye saw the difficulty, his brain told him the one way that it might be overcome, and he was brave enough to take that way; but the thought of his family held him for a time. Could he sacrifice them?

Still the two armies stood facing each other; still the Austrians in their pride looked scornfully at the little Swiss company. There should be a break in that solid phalanx! With a cry of "Make way for liberty!" Winkelried sprang forward, spread his arms, and gathering several of the enemies' spears, pressed them into his breast.

His deed was an inspiration to the Swiss, and they pressed forward into the little gap which he had made, and before the close of the day the Austrian army had fled from the field, leaving fourteen hundred dead, and the Swiss had won a complete victory. Five hundred years later, in 1886, a monument was erected on this battlefield in honor of the heroic self-sacrifice of a common Swiss soldier.

It is not to be understood that all historical stories told to children are to be stories of bravery on the battlefield. It is, in fact, true that while such tales stir the blood of young people, they cannot have the same effect that stories of the heroes of peace may have, for very few will ever be called upon to show bravery on a battlefield. However, young children are much more interested in stories which have vigorous action, and it is only as they grow older that they are really interested in the struggle and accomplishments of even the greatest statesmen.

Joseph and His Brothers

Jacob, the patriarch, had many sons; but of them all, Joseph, the youngest, was his favorite. Nor did he attempt to conceal this from the other ten sons. Naturally they were jealous of Joseph, and this jealousy was increased when their father gave to the boy a most wonderful coat—a coat of many colors.

Joseph, though a good boy, was somewhat spoiled by his father and was not always wise in the way he talked to his older brothers. For instance one day he went to them in great glee and said:

"Hear this dream which I have dreamed; Behold, we were binding sheaves in the field, and my sheaf arose and stood upright, and your sheaves bowed down and worshiped it."

This made the brothers very angry, and they cried:

"And do you really believe that you shall reign over us?"

But their anger was no warning to Joseph, and a few days later when he dreamed that the sun and moon and eleven stars bowed down before him, he foolishly told this dream to his father and to his brothers. And his father, seeing the effect it had on his older sons, rebuked Joseph.

"Shall I and thy mother," he said, "and thy brothers indeed come to bow down ourselves to thee to the earth?"

Now Jacob had many sheep, and the ten older sons had gone with them to a fine feeding-ground in Shechem. One day Jacob called Joseph to him and said:

"Go and see whether it is well with your brothers and with the flocks and bring me word."

But when Joseph reached Shechem he found no trace of his brothers. At last, after wandering about, he met a man who told him that the brothers with all of their flocks had gone to Dothan, and there Joseph found them.

As the boy advanced toward them across the field, one of them said scornfully to the others, "Behold the dreamer cometh," and they began to plot in their envy and their hatred how they might put the boy out of the way.

One brother suggested that they kill him and drop his body into a pit and then return to their father, declaring that some wild beast had eaten him. "Then we shall see," he said, "what shall become of some of his dreams." But Reuben, the oldest son, had pity on the boy and advised them not kill him but put him into a deep pit which was near at hand; for Reuben meant when the other brothers were out of the way to save Joseph and send him back to his father.

After they had put the poor boy into the pit, they sat at their meal discussing what they might do with him; and as they talked they saw coming toward them a company of merchants with camels, who were going down into Egypt. One brother, perhaps because he was avaricious, perhaps because he did not want Joseph killed, suggested that they sell the boy to the merchants to be sold again as a slave in Egypt.

This they did, and then, because they feared to tell their father of what they had done, they took Joseph's coat of many colors and dipped it in the blood of a kid and took it to their father. Even now they did not lie to him outright and say, "Your son has been killed;" they showed him the coat stained with blood and said, "Can you tell whether this is our brother Joseph's coat?"

And Jacob knew it instantly and said, "It is my son's coat. An evil beast has devoured him."

Meanwhile, Joseph had been carried by the merchants to Egypt and there sold to Potiphar, an officer of Pharaoh the king. And from the very first the young man prospered; for Potiphar found that he could be trusted. His master's wife, however, became angry with him most unjustly and told false tales of him to Potiphar, who in his wrath had him put into prison. But even here Joseph was fortunate,

for the keeper of the prison soon discovered that he was wise and trustworthy, and gave him control over all the other prisoners.

Now, in the prison at this time there were two servants of Pharaoh the king of Egypt—his chief butler and his chief baker.

One night each of these men dreamed a dream, and when Joseph visited them in the morning he said, "You look sad. Has anything troubled you?"

And in reply they told him of their dreams and begged him to interpret them for them; for in those days people believed that things which were to happen in the future were foretold by dreams. First the butler told his dream:

"In my dream, behold, a vine was before me; and in the vine were three branches, and it was as though it budded, and her blossoms shot forth; and the clusters thereof brought

And it all happened as Joseph had predicted, for in three days the chief butler was restored to his place, while the chief baker was hanged. But the butler promptly forgot the promise he had made to Joseph to remember him when he was restored to his place, nor did his promise occur to him for two full years. Perhaps he would not have thought of it even then, had not circumstances called it to his mind.

One night Pharaoh the king dreamed two dreams which troubled him strangely. All the magicians of his kingdom were sent for and questioned, but not one of them could give him an explanation of the strange dreams. Now it was that the butler remembered the young man who had so wonderfully interpreted his dream in the prison, and he told Pharaoh of Joseph. Joseph was summoned to appear before the king, and when he stood in the royal presence Pharaoh said:



JOSEPH CARRIED INTO EGYPT

forth ripe grapes. And Pharaoh's cup was in my hand; and I took the grapes and pressed them into Pharaoh's cup, and I gave the cup into Pharaoh's hand."

And Joseph interpreted thus:

"The three branches are three days. Yet within three days shall Pharaoh lift up thine head, and restore thee unto thy place; and thou shalt deliver Pharaoh's cup into his hand, after the former manner when thou wast his butler. But think on me when it shall be well with thee, and shew kindness, I pray thee, unto me and make mention of me unto Pharaoh, and bring me out of this house. For indeed I was stolen away out of the land of the Hebrews, and here also have I done nothing that they should put me into the dungeon."

The baker, pleased that the butler's dream had been so happily interpreted, then told his:

"I also was in my dream, and, behold, I had three white baskets on my head; and in the uppermost basket there was of all manner of bakemeats for Pharaoh, and the birds did eat them out of the basket upon my head."

But Joseph's interpretation of this was by no means so happy. He said:

"The three baskets are three days. Yet within three days shall Pharaoh lift up thy head from off thee, and shall hang thee on a tree, and the birds shall eat thy flesh from off thee."

"In my dream I stood upon the bank of a river and there came up out of the river seven kine, fat and well-favored, and they fed in a meadow. And soon there came up out of the river seven other kine, lean and ill-favored, worse than any I have ever seen in the land of Egypt; and the lean kine ate up the fat kine, nor were they, after they had eaten, any less poor and ill-favored. The second dream was very like the first. Seven good, full ears of corn came up on one stalk, and seven withered, thin ears, blasted with the east wind, sprung up after them and devoured them. Both of these dreams I have told to my magicians, but they were unable to interpret them.

Without hesitation Joseph replied:

"The seven good kine and the seven good ears are seven years; the seven thin kine and the seven blasted ears are another seven years. This means that there shall be another seven years of great plenty throughout all the land of Egypt, and then seven years of famine so severe that all the plenty shall be forgotten in the land of Egypt.

"Now the wise thing for the king to do is to choose a discreet man and put him in power over all the land, and let this man see that during the seven good years much food is stored up against the seven years of famine."

Pharaoh was much impressed by the advice of Joseph, and when he came to choose such a

man to set over all his kingdom, he decided that there was no one among his own people whom he could trust as he could this young man. Thus, at the age of thirty, Joseph became practically ruler over Egypt, second in rank only to the king.

Everything happened as the dreams had foretold, and during the seven years of plenty Joseph and his officers were very busy getting food into the storehouses. Thus when the years of famine did come there was food for all who came to Joseph to buy.

Now it was not only in Egypt that the famine was severe; all the neighboring countries were suffering, and men from all countries came into Egypt to Joseph to buy corn. And

they told him the truth about themselves—that they were all sons of one father and that they had one young brother at home in Canaan, and had had another. We can imagine Joseph's feelings when they said, "One brother is not."

Finally Joseph declared that he would sell them corn and allow them to go back to their own country only if one of them remained as a pledge that the other nine would return and bring with them their brother Benjamin. Simeon was the one chosen to remain, and the others departed without him, with their beasts of burden carrying sacks full of grain.

Now Joseph had commanded his servants to place in the sacks of grain the money which



JOSEPH MEETS HIS FATHER

among those who came were the ten brothers of Joseph. The youngest brother, the child Benjamin, they left with their father in Canaan, because the old man was so devoted to the child that he could scarce live away from him.

When the ten Brothers of Joseph appeared before him, he knew them instantly in spite of the years that had passed. But they did not recognize, in the splendidly garbed favorite of the king, the brother whom they had sold, and who they imagined had died long since. To test them Joseph spoke to them roughly and even accused them of being spies; but

the brothers had brought, with them to pay for the grain. Thus when they reached home they found that they had not only food, but all of their money.

Jacob his father, was much distressed when he heard that they had promised to take Benjamin down to Egypt with them, and cried out to them:

"You have, bereaved me of my children. Joseph is not and Simeon is not and you will take Benjamin away." And for a long time he refused to let them return to Egypt.

At length, however, the famine became so severe that it was absolutely necessary that

they should in some way obtain more grain, and finally Jacob consented to allow Benjamin to go with them, Judah, one of the older brothers, pledging his own life that the boy should return unharmed.

When the brothers with the young Benjamin appeared before Joseph he was strangely moved, and he commanded that a feast be prepared for them in his own house. Joseph ate by himself, the Egyptians by themselves and the brothers by themselves, as the law of the Egyptians forbade them to eat with the Hebrews.

When the meal was over, Joseph commanded his servants to fill the brothers' sacks with grain and again to place each one's money in the mouth of his sack. In addition to this he ordered that his own silver cup be placed in Benjamin's sack.

The next morning when the Hebrews had gone but a little distance from the city Joseph's steward ran after them and overtook them and cried:

"Why have you repaid my master with evil when he did you nothing but good? One of you has stolen his silver cup."

The brothers protested that they knew nothing of the cup and declared that if it should be found upon any one of them that one should die and the rest should return as servants to Joseph. But when the search was made, the cup was found in Benjamin's sack.

Sadly the little procession which had started out so joyously turned and went back to the palace of Joseph. They could not understand what had happened; they felt certain that Benjamin had not taken the cup, but how could they prove this? And they were responsible to the boy's father for his safety.

Joseph, when he met them, pretended to be very severe, but when Judah declared that they were all ready to be servants of Joseph, Joseph refused saying:

"You may all go in peace, except the one in whose sack the cup was found. He shall be my servant." Then Judah stepped out before the rest of the brothers and told Joseph how he had become surety to his father for the boy, and begged Joseph to allow him to remain as bondman but to let the boy go back to his father.

"For how," he concluded, "shall I go up to my father and the lad be not with me?"

At this Joseph could restrain himself no longer. Sending all his servants and officers from the room, he cried:

"I am Joseph. Does my father yet live?"

Of course the brothers were afraid of his vengeance, but he comforted them and forgave them, assuring them that they had done him no harm, but only good, by selling him into Egypt.

"For God," he declared, "did send me before you to preserve life."

The joy and relief of the brothers of Joseph were beyond bounds and Joseph himself was no less happy. Even Pharaoh, the king, when he heard that Joseph's brothers had come, was pleased, and sent word that they were to return to Canaan for their father and their

households, and that they were then all to come down into Egypt, where he would allot to them for their homes the best land in the kingdom.

Joyfully the brothers returned home and told their father the wonderful story, which the old man could not at first believe. When he was at last convinced, he exclaimed:

"It is enough! Joseph my son is yet alive. I will go and see him before I die."

With their families and their servants, their flocks and their herds and their beasts of burden, the father and brothers of Joseph journeyed down into Egypt. They found that Pharaoh was as good as his word. He gave them land in plenty and they settled down in the strange land which yet did not seem strange to them because Joseph was ruler over all of it.

STOSS, VEIT (?1440-1533), a German sculptor, considered the greatest wood carver of Germany. He was born at Nuremberg, and spent his life there and at Craeow. Owing to his eccentric character he had many quarrels with the city authorities of Nuremberg, and he was several times imprisoned. He died at an old age, totally blind. Most of his works are religious and show deep spiritual feeling, a quality which was lacking in other artists of his time. His most famous wood carvings include the high altar in the Church of Saint Mary's, Craeow, and *The Angel's Salutation* in the Church of Saint Lawrence, Nuremberg. A relief representing the *Coronation of the Virgin* is in the Germanic Museum of Nuremberg. His best sculpture is *The Last Supper*.

STOVE, a piece of domestic furniture consisting of a box made of iron, brick or tile in which fuel is burned to heat rooms or houses or for cooking. The first stoves, made of brick, stone or earthenware, were very large. Iron stoves were first made in France early in the eighteenth century. From there they were introduced into England about 1716, and were adapted to the use of coal. In 1745 Benjamin invented a stove with a downward draft that caused an even distribution of heat over the sides. This was a great improvement over any stove that had preceded it, and from it developed the modern stove heater. Stoves did not come into general use in the United States until 1825. Prior to that time, dwelling houses were heated chiefly with open fireplaces. Country churches were not heated, but women carried foot stoves to church. These were small tin or sheet iron boxes, with perforated sides, enclosed in wooden cases. Just before the start to church the stove was filled with burning coals.

The advantage of the modern stove over the fireplace is its greater heating capacity. Whereas the best fireplaces utilize only about fifteen per cent of the heating power of the fuel, stoves make available from forty to sixty per cent.

There are now many designs of stoves upon the market, intended for burning wood, coal, coke, kerosene, gasoline, gas or electricity. Gas stoves are in general use in cities for cooking, while gasoline and kerosene stoves have for years been popular in isolated communities.

STOWE, HARRIET ELIZABETH BEECHER (1811-1896), an American novelist, best known as the author of *Uncle Tom's Cabin*. This book, published in 1852, had perhaps a greater influence than any other piece of fiction ever written, was translated into more than twenty languages and had an unprecedented sale. Though loose in construction and marred by signs of hasty composition, *Uncle Tom's Cabin* is nevertheless a strong book, because it tells vividly a story of slavery. It was dramatized shortly after its publication and has had wonderful popularity as a play.

Mrs. Stowe, sister of Henry Ward Beecher, was born at Litchfield, Conn., where her early life was spent. Her family moved in 1832 to Cincinnati, and four years later she was married to Rev. Calvin E. Stowe of that city. Her knowledge of the condition of the slaves was gained by visits to slave states and possibly by encounters with escaping slaves. *Uncle Tom's Cabin* was by no means her only work, but the others are practically unnoticed, because of the success of the one. Among the others may be mentioned *The Minister's Wooing*, *Oldtown Folks*, *Dred* and *My Wife and I*.

STRABISMUS, *stra biz'mus*. See SQUINTING.

STRABO (about 64 B. C.—about A. D. 19), a Greek geographer and historian, a native of Pontus and a resident of Rome after his thirty-fifth year. His earliest writing was his *History*, of which but a few fragments remain. His great work, however, a geography, in seventeen books, has been preserved entire, with the exception of the seventh book, of which there is only an epitome. The first two books are introductory, the next eight treat of Europe, the six following treat of Asia and the last discusses Africa. This is the most important geographical work that has come down from antiquity.

STRADIVARIUS, *strah de vah're us*, ANTONIO (1649-1737), a celebrated violin maker, born in Cremona, Italy. He was a pupil of Nicolo Amati, in whose employment he remained until 1700, when he began making violins on his own account. It was he who settled the typical pattern of the Cremona violin, and his instruments, for tone and finish, have never been excelled.

STRAFFORD, THOMAS WENTWORTH, Earl of (1593-1641), an English statesman. He sat in Parliament for Yorkshire for a number of years and in the first Parliament of Charles I strongly opposed the royal aggressions. In 1628, he supported the Petition of Right. As he felt, however, that Parliament was going too far in its opposition to the king, he went over to the king's side, was made baron, then viscount and president of the Council of the North and privy counselor. In 1633 he went to Ireland as lord deputy and attempted to impress his system of "thorough," by which he meant thorough devotion to the interests of the king. Although Ireland was commercially and industrially the better for his rule, the despotism employed in putting his system into practice made him exceedingly unpopular.

After his return to England in 1639 Wentworth was made Earl of Strafford and became even more powerful in the king's council. When the Scots rebelled against the king, Strafford went to Ireland to raise an army, to help put down the insurrection, and this act was later used against him in his impeachment. One of the first acts of the Long Parliament was the impeachment of Strafford. It became plain that the House of Lords was not likely to render judgment against him, and the Commons were therefore obliged to change their proceedings to a bill of attainder. This was passed by both houses, and Charles I, despite the fact that he had promised that Strafford should come to no harm, was forced to sign it. Strafford was beheaded in May, 1641.

STRAITS SETTLEMENTS, a British colonial settlement comprising the southern part of the Malay Peninsula and some of the adjacent islands. It includes the settlements of Singapore Island, Penang and Malacca, on the peninsula. The total area is about 1,600 square miles. The population is approximately 760,000; of these, 8,000 are whites, and the remainder are Chinese, Malays and natives of India. The chief ports

are Singapore, on the island of the same name, and Georgetown, on the island of Penang. Through them pass quantities of coffee, rubber, gum, spices, tin and rattan. Singapore (which see) is the capital.

STRAMONIUM, also called **JIMSON WEED** and **STINK WEED**, a poisonous herb of the nightshade family, which grows to the height of from three to five feet. It has an erect stem, numerous branches, large, triangular leaves, and long, fringed, trumpet-shaped white flowers. Green burs enclose small, dark, wrinkled seeds. Both leaves and seeds are used in making the drug stramonium, which is similar to belladonna and is used to relieve asthma. See **NIGHTSHADE**.

STRASSBURG, *strahs'boorK*, FRANCE, the capital of Alsace-Lorraine, is situated on the Ill River, 300 miles east by south of Paris and about 370 miles southwest of Berlin. It is one of the most strongly fortified towns in the world, and is practically encircled by forts and ramparts. For centuries the city has been noted for its cathedral, the oldest part of which dates from the beginning of the eleventh century, and which was completed in the fifteenth century. In the tower is the famous Strassburg clock (which see). Other buildings of note are the Church of Saint Thomas; the municipal museum of art, which was formerly an episcopal palace, and the imperial palace. The leading educational institution is the University of Strassburg. Its library contains over 1,000,000 volumes, and in addition there is a municipal library of over 115,000 volumes. The city is connected with the Rhine by canals, and it also has communication with a number of the waterways of France. The industrial establishments include tobacco and cigar factories, organ works, machine shops, printing houses, tanneries and foundries.

Strassburg is supposed to have been founded by the Romans, who named it *Argentoratum*. In the sixth century its name was changed to Strassburg, and in the beginning of the tenth century it came under the control of the German emperors. It was united with France in 1861, but at the close of the Franco-German War, along with Alsace-Lorraine it became a part of the German Empire. In 1918 it again reverted to France (see **WORLD WAR**). Population, 1910, 178,891.

STRASSBURG CLOCK, the famous clock in the tower of the Strassburg Cathedral.

The present one is the third to acquire fame. The first was built in 1352; the second in 1570. The last, made early in the nineteenth century, is thirty feet high, and fifteen feet wide at the base. At the bottom is a large globe of the heavens, which shows the course of the stars and the passing of each important one across the meridian of Strassburg. Behind this globe is a calendar, which shows the day of the month and the occurrence of all the religious festivals. Next above the dial is a planetarium, and above this is a globe which shows the phases of the moon. On the next floor are several figures, which strike the quarter hours. These represent the different periods of life—infancy, youth, old age and death. Above all is a figure of Christ. At noon on each day, the twelve apostles pass before him in procession, and at the same time a cock appears and crows three times. See **STRASSBURG**.

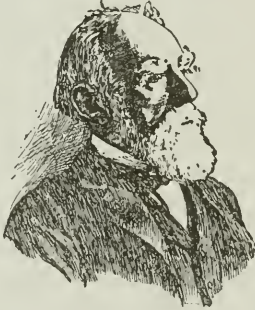
STRATEGY, *strat'e ji*, the art of planning a military movement in a way to give an army every possible advantage over the enemy. It is to be distinguished from *tactics*, which have to do with the actual business of fighting. When in the summer of 1914 the Germans lured the Russian army into the marshy region of the Masurian Lakes in Northern Poland, they executed a strategic campaign which resulted in one of their notable victories. This was one of the few conspicuous strategic feats of the World War. In fact, in modern warfare the opportunities for the exercise of strategy are rare. Formerly, when wars consisted of campaigns and when armies played hide and seek chasing each other over extensive areas of territory and engaging in occasional battles, success depended as much on strategy as upon man power and equipment. To-day it is becoming a less important factor. When opposing armies meet along a front hundreds of miles in extent they come to a standstill. The points of advantage are seen from both sides, and the efforts to gain them are tactical rather than strategic.

STRATFORD, ONT., the county seat of Perth County, situated on the Avon River and on six lines of the Grand Trunk Railway, eighty-eight miles west of Toronto. It is quite an important industrial center, having about sixty manufacturing enterprises, among them being foundries and machine shops, railroad shops, wire fence works, chemical works, woolen factories, hosiery fac-

tories, and a boot and shoe factory. Population, 1911, 12,946; in 1918, about 17,000.

STRATFORD-UPON-AVON, ENGLAND, a municipal borough, famous as the birth-place of Shakespeare, situated eight miles southwest of Warwick. The town is characterized by broad streets and old wooden houses. It contains the parish church, in which Shakespeare lies buried, and the house in which he was born, and in which are preserved portraits, early editions and other objects of interest related to the poet. The Shakespeare Memorial Building, including a theater, the old Guild Hall and the Shakespeare Monument, are other objects of interest. Anne Hathaway's cottage is about one mile west of the town. Population, 1911, 8,500.

STRATHCONA AND MOUNT ROYAL, DONALD ALEXANDER SMITH, Baron (1820-1914), a Canadian statesman and financier, was born at Forres, Scotland. In 1838 he was appointed a junior clerk in the Hudson's Bay Company. For thirteen years he was stationed at Hamilton Inlet, Labrador; here, besides mastering the fur trade, he spent much of his time in introducing improvements into the conditions of life, being the first to



LORD STRATHCONA

prove that potatoes could be grown there with success. Then for ten years he was on Hudson Bay, where he rose to be a chief trader and later chief factor; and in 1868 he became resident governor at Montreal. During the disorders in 1870 in the Red River settlements he used his influence in settling the disputes without bloodshed. He was elected to the first legislative assembly of the new province of Manitoba and then to the House of Commons. In Parliament he was prominent for his independence and his advocacy of railroad expansion. Together with his cousin, Lord Mount Stephen, he was one of the organizers of the present Canadian Pacific Railway, and it is largely due to his energy and ability that the project was completed. Except from 1882 to 1887 he continued to sit in Parliament until 1896, when he succeeded Sir Charles Tupper as

high commissioner in London. Smith was raised to the peerage in 1897. He received numerous honorary degrees from colleges and universities and for many years was chancellor of Aberdeen and McGill universities.

STRATIFIED ROCKS, rocks which are composed of several layers, or *strata*, formed by the slow hardening of mud. When the earth was young these strata lay horizontally, but with the wrinkling of the crust the strata became folded, and in some places they have cropped out and become visible. Strata that do not lie horizontally are said to *dip*, and the angle of inclination is called the *angle of the dip*.

STRAUSS, JOHANN (1825-1899), an Austrian composer known as the "Waltz King." He was born at Vienna, the son of Johann Strauss, also a well-known composer of waltz music. At the age of nineteen he began conducting a small restaurant orchestra, and afterwards, with a larger orchestra, he toured Europe, everywhere winning applause for his artistic dance music. In 1855 he conducted summer concerts at the Russian capital, and in 1863 became conductor of the Russian court balls. He wrote more than four hundred waltzes, many of them world-famous, especially *The Beautiful Blue Danube*, *Artist's Life* and *Wine, Woman and Song*.

STRAUSS, RICHARD (1864-), a German composer and conductor, the most distinguished representative of the school of music founded by Richard Wagner. He was born at Munich, and with extraordinary precocity, at the age of six wrote music good enough to publish. While still in his teens he wrote *Symphony in D Minor* as well as numerous songs and instrumental pieces, gaining a wide popularity. He is especially noted for his descriptive pieces, or "tone poems," including *Till Eulenspiegel*, *Don Quixote* and *Domestic Symphony*, in which melody is sacrificed for the sake of realistic effect. His operas *Elektra* and *Salome* have provoked much criticism because of their stark realism. Of all the songs written in the last few decades none are more popular than those of Strauss. They are rich in melody, sentiment and color.

STRAW, the dried stems of certain plants. It is used in the manufacture of mats, coarse cloths, paper and various other articles, and it is also employed for fodder and bedding for animals. It is principally used in the

manufacture of hats, an industry extensively carried on in France, Italy, Switzerland, Austria, Germany, Bohemia and China. In America the center of the hat industry is Massachusetts. The straw most used for hats is wheat. The stalks are pulled up, cut in pieces, bleached and then woven into the desired shapes.

STRAWBERRY, *straw'ber i*, a small plant of the rose family which produces a delicious red fruit also called strawberry. In the technical sense, the strawberry cannot be classified as a berry, for, unlike the currant and the gooseberry, it has no outer skin enclosing pulp and seed, the tiny yellow seeds lying in little pits on the surface. It is heart-shaped and juicy, with a delicate perfume and rich flavor. It is a favorite fruit in many countries and is widely cultivated. The plant is hardy, and in America can be made to grow and produce from Florida to Alaska, though it thrives best in the middle latitudes, at about the fortieth parallel. Maryland is the foremost strawberry-producing state, New Jersey, New York, California, Missouri and Michigan following in the order named. Ontario, producing eleven million quarts annually, compares not unfavorably with Michigan, which has an output of fourteen millions.

The cultivation of the strawberry is not difficult, if a few essentials are regarded. The plants, which are small, seldom more than five inches high, send out runners or vines, which creep along the ground and at intervals take root. The young plants obtained from the rooted runners are the most productive. They are transplanted in late autumn or spring in rows or hills three or four feet apart, with fifteen inches separating the plants. As they grow they send out runners, which may be cut off or allowed to mat, the former treatment resulting in less numerous berries but larger ones. The richer the soil the better, and it should have been under cultivation at least two seasons. Success with strawberries means crop rotation, and when the bearing season is over the beds should be plowed under and planted to something else for two or three years before strawberries are again planted.

When the plants are set out in the fall they should be mulched with straw. This should be raked between the rows but left around the plants, as it keeps the berries off the

ground. To prepare soil for spring planting, drain thoroughly and cover with manure. In the spring rake off all trash and work the soil until it is light to a depth of six inches. A good fertilizer, such as nitrate of soda, applied just before the blossoming, increases the crop. The plants require a great deal of moisture, and sometimes require irrigation.

The strawberry plant is attacked by several insects and is subject to blight or rust, which appears on the leaves as purple spots. As this disease may be carried over the winter all foliage should be burned and the young plants sprayed with Bordeaux mixture. Strawberries should never be planted after grass, for the field is certain in such case to contain grubs. The strawberry weevil, which attacks buds and blossoms, can be checked by spraying with white hellebore and kerosene emulsion; and the latter preparation will also destroy the yellow caterpillars that sometimes infest the plants.

STREATOR, *street'or*, ILL., a city in La Salle County, ninety miles southwest of Chicago, on the Vermilion River and on the Atchison, Topeka & Santa Fé, the Chicago & Alton, the Chicago, Burlington & Quincy, the Wabash, the New York Central and the Chicago, Ottawa & Peoria railroads. It is situated in an agricultural section and is also near deposits of coal, fire clay and building stone. The leading industrial establishments are glass works, foundries, machine shops, car shops, automobile factories and brick and tile works. Streator is built on a bluff along the river. There are a Federal building and a Carnegie Library. The place was settled in 1860 and was chartered as a city in 1882. Population, 1910, 14,253; in 1917, 14,313 (Federal estimate).

STREET RAILWAY. The street railway is an American idea, although it was developed from the English tramway. Throughout Europe street railways are called *trams*. The first street railway was laid in New York City, from the Bowery to Harlem, in 1831 and 1832. The car used was an old-fashioned stagecoach, and it was hauled by horses. Afterwards steam power was tried, but it was not successful, and the horses were reinstated. The success of this line led to the construction of others in New York and other cities, and before 1860 street railways were common in all large cities of the United States. Since that time they have been extended throughout Europe.

For a long time horses were the only motive power used in operating the cars. Several attempts to use steam were made, but none was successful. In 1873 the cable as a motive power was introduced in San Francisco. An endless cable was wound around a drum by a stationary engine; the cable passed under the middle of the car track, and the motor car, called the *grip car*, was attached to it by a grappling device operated by levers. Cable cars were introduced in several large cities, and were successful, but the invention of an electric motor that could be successfully used on street cars soon caused all cable systems to be replaced by electric cars, and now electricity is practically the only power used in operating street railways. See ELECTRIC RAILWAY.

STRENGTH OF MATERIAL, the term used to express the resistance offered by any building material to a force that tends to change its shape. Materials are subject to several kinds of stress, the chief of which are the stress of direct pull, or *tensile* stress; the stress of pushing together, or *compressive* stress; the stress of tending to slide on parallel surfaces, or *shearing* stress; and the *twisting*, or *torsion* stress, illustrated by a shaft to which a crank is attached. All other forms of strain are combinations of these.

Materials vary greatly in their strength, and different samples of the same material, as white pine, may show a marked variation in strength. For this reason engineers re-

quire that the material they are to use in any large structure be carefully tested before it is accepted. Most ingenious machines for testing the strength of materials have been constructed, and the strain applied is that to which the material will be most subjected. A given unit, which in English-speaking

countries is the square inch (in countries where the metric system is in use, the square centimeter) is employed in making the test. For instance, a rod of oak one inch square has a tensile stress of 12,000 pounds, and one of white pine a stress of 8,000 pounds. The stress on this area is called the *unit of stress*. The *ultimate strength* of the material is the unit of stress reached just before rupture takes place. The ultimate strength is from two to four times as great as the stress of the unit before it begins to change form.

To find the tensile strength of any material a specimen one inch square and eight inches long is pulled apart. The load is applied gradually and each addition to the load produces a proportionate increase in length in the specimen until a point is reached where the elongation increases more rapidly than the load. The stress at this point is called the *elastic limit* of the material.

Wrought iron and steel offer the greatest resistance to tensile strains; the strength of wood in this direction varies according to its seasoning and specific gravity. The heavier the wood is, in general, the stronger it is. The transverse strength of beams is determined largely by their elasticity. The property varies greatly in different materials. Wood has a greater elastic range of action than iron or steel bars and it consequently sinks or deflects to a greater degree under a given weight. Any strain beyond the *elastic limit* entails fracture. Increased stiffness or transverse resistance of beams is rapidly ob-

MATERIAL	TENSILE STRENGTH		CRUSHING STRENGTH		SHEARING STRENGTH	
	ULTIMATE	ELASTIC	ULTIMATE	ELASTIC	ULTIMATE	ELASTIC
Cast iron... {from	30,500	Indefinite	130,000	Indefinite	12,000	Indefinite
{to	10,800	Indefinite	50,000	Indefinite	8,700	Indefinite
Wrought iron bars... {from	67,000	30,000	50,000	30,000	49,000	22,000
{to	33,500	(average)	(average)	(average)	22,400	(average)
Steel plates {from	65,000	42,000	.....	38,000	50,000	.....
{to	110,000	67,000	.....	71,000	83,000	.....
Steel boiler plates	66,000	36,000	.....	.....	56,000	.....
Rivet steel.	65,000	46,000	.....	.....	55,600	.....
Copper, rolled	.....	5,600	.....	4,000	.....	3,000
plates	31,000	.....	.....	.....	.....	.....
Copper, annealed wire	45,000	.....	.....	.....	.....	.....
Brass	17,500	.....	.....	.....	.....	.....
{from	29,000	.....	.....	.....	.....	.....
{to	7,500	3,200	.....	.....	.....	.....
Cast zinc.....	.....	.....	.....	.....	.....	.....

quire that the material they are to use in any large structure be carefully tested before it is accepted. Most ingenious machines for testing the strength of materials have been constructed, and the strain applied is that to which the material will be most subjected. A given unit, which in English-speaking

tained with an increase of depth of the beam. With the exception of wood, materials offer a greater resistance to a crushing force than to a tensile strain. Cast iron is superior to wrought iron in this respect and is consequently much employed in the construction of foundations. Torsional stress tries the

solidity and tenacity of metals more than any other kind of stress. But the torsional strength of shafts increases very rapidly as the diameter is enlarged. The distribution of material in hollow forms conduces to the greatest strength and stiffness, in combination with the minimum consumption of material. A familiar instance of the hollow construction is the stem of grasses, and especially the bamboo, while another example is that of the hollow bones of animals.

The table from Unwin, on page 3450, is valuable for reference.

STRIKE, an action taken by workmen in any branch of industry when they cease from work, with the object of compelling their employers to accede to certain demands made by them. The strike is distinguished from a *lockout*, which is the retaliatory measure adopted by employers to resist such demands by stopping the operation of their plants and throwing their workmen out of employment.

During the World War labor supported the governments of leading countries, cooperating in almost every instance to meet pressing wartime emergencies. After the cessation of hostilities, due to general unrest all over the world and prevailing economic, rather than political conditions, labor again took recourse to its weapons of strikes on a stupendous scale. Although there are many agitators in the ranks, a major portion of labor is loyal to democratic principles and does not countenance bickerings or strikes; is more than ready to cooperate with capital for the general good of all. See **LABOR ORGANIZATIONS**.

STRINDBERG, AUGUST (1849-1912), one of the foremost Swedish writers of his time, the author of dramas, novels, lectures and numerous other literary forms in which he showed himself in turn romanticist, naturalist, mystic and skeptic. Strindberg was born at Stockholm, the son of an obscure tradesman and a barmaid. He attended the University of Upsala, and after trying his hand at school teaching, tutoring and journalism, he procured a post in the Royal Library, Stockholm. He was a zealous supporter of the theory that woman is inferior to man, mentally and morally as well as physically. He was three times married and three times divorced. His first important play, *Master Olof*, was produced in 1878. This was followed by *The Red Room*, *The Bondswoman's Son*, *The Author*, *A Fool's Confession* (auto-

biographic), *Inferno* and *Legends*. *The Natives of Hemsö* is a brilliant novel of Swedish peasant life. *Utopias Realized* is a defense of socialism. Notable among his plays are *Gustavus Adolphus*, *The Father* and *Lucky Pehr*.

STRONTIUM, *stron'she um*, a yellowish metallic element, first observed in the lead mines of Strontium, Argyllshire, Scotland, and separated from its compounds by Davy in 1808. Though less abundant than barium, it occurs in nature in similar forms of combination. It is malleable and ductile, and burns with a crimson flame when heated in air. Strontium is used in extracting beet sugar. The nitrate made from it is used in the manufacture of fireworks.

STRYCHNINE, *stri'k'nin*, a poisonous drug obtained from the seeds of *nux vomica* and certain other plants. It is prepared in the form of crystals, which are odorless but intensely bitter. One-eighth of a grain of strychnine will kill a large dog; three-eighths of a grain will produce spasms in man. A half grain is sometimes fatal to man, a whole grain almost always so. The symptoms of strychnine poisoning are difficulty in breathing, followed by twitching of the limbs and convulsions, in which the body becomes rigid and is often bent strongly backward. In very small doses—from one-fifteenth to one-fiftieth of a grain—strychnine is valuable as a tonic.

STRYCHNOS, *stri'nos*, the botanical name of a genus of shrubs or trees, which are found principally in the tropical parts of Asia and America. The plants have leathery leaves and dense clusters of white, valve-shaped flowers. Some of the most powerful drugs are produced from plants of the genus, among them strychnine and *nux vomica* (which see).

STUART, or **STEWART**, a royal family of England and Scotland. The founder of the house seems to have been a Norman baron named Fitzhaald, a follower of William the Conqueror, whose second son, Walter, entered the service of David I of Scotland and became steward of the royal household. The name of the office was adopted by the family as a surname. Walter obtained large grants of land from David. James, the fifth steward, was chosen as one of the regents, on the death of Alexander III, and died in the service of Bruce in 1309. His son, Walter, the sixth steward, married Marjory, daughter of

King Robert I, a union which secured to his family the crown of Scotland in the event of the extinction of the royal line. Walter died in 1326 and was succeeded by his son Robert, who, on the death of David II without issue succeeded to the crown as Robert II. With James VI of Scotland, son of Mary Queen of Scots, the Stuart family succeeded to the throne of England. (For its history subsequent to this time see JAMES I; CHARLES I; CHARLES II; JAMES II; MARY II; ANNE.) James II was driven from the throne of England, and for years there was a struggle to replace the Stuarts on the throne. Mary of Modena, second wife of James II of England, gave birth to James Edward, commonly called the Old Pretender (see STUART, JAMES EDWARD). In 1715 an unsuccessful attempt was made by the Jacobites, or Stuart party, to set this prince on the throne of his ancestors by force of arms. He married a granddaughter of John Sobieski, king of Poland, by whom he had two sons, Charles Edward, the Young Pretender, and Henry Benedict Maria Clement, who became a cardinal in 1747.

STUART, CHARLES EDWARD, called *The Young Pretender* (1720–1788), eldest son of James Edward Stuart, the Old Pretender. He was promised aid by France in an invasion of Great Britain, and accordingly in 1745 he landed in Scotland. With the help of the Scotch Highlanders, who joined him promptly, he won a victory over the royal forces, but when he entered England he found little support and was finally obliged to retreat without attempting to enter London. At Culloden in 1746, he was completely defeated by the Duke of Cumberland, and for five months he remained hidden in various places in the Scotch Highlands and in the Hebrides, protected by the loyalty of the Scotch. He finally escaped to the Continent, where he passed the remainder of his life.

STUART, GILBERT (1755–1828), an American painter, noted for his portraits of famous Americans. He was born in Narragansett, R. I. In 1775 he went to London, where he had his first instruction under good masters. There he remained until 1792, and during the last part of his stay his genius was fully recognized. In 1795 he painted the first of about forty portraits of Washington on which, more than on any of his other work, his fame rests. These portraits are too much idealized to be faithful likenesses

of the first President, but they represent him as the world likes to think of him and so are the most popular of all Washington portraits. Among Stuart's other sitters were John Adams, Jefferson, Madison, Monroe, John Jay, John Jacob Astor, William Ellery Channing and Josiah Quincy. See WASHINGTON, GEORGE, *portrait*.

STUART, JAMES EDWARD, called *Chevalier Saint George*, or *The Old Pretender* (1688–1766), son of James II of England and Mary of Modena, his second wife. He was born a short time before his father was deposed; in fact, his birth and the fear that on his accession England would become permanently a Catholic country, had much to do with the overthrow of James. In 1715 an unsuccessful attempt was made by the Jacobites to secure the throne for him. The remainder of his life was spent mostly in Rome. His wife was a granddaughter of John Sobieski of Poland.

STUART, JAMES EWELL BROWN (1833–1864), an American general, born in Patrick County, Va. He was graduated at the United States Military Academy in 1854 and was promoted rapidly in the army. When Virginia seceded, he was made lieutenant-colonel of Virginia troops, and commanded the Confederate cavalry in the first Battle of Bull Run. Later in the same year he became a brigadier-general. In June, 1862, he conducted a daring reconnaissance of McClellan's army on the Chickahominy, fought at the second Battle of Bull Run, led the advance of Jackson's Maryland invasion and fought at South Mountain, Antietam and Fredericksburg. After the fall of Stonewall Jackson, Stuart succeeded to the temporary command of Jackson's corps at Chancellorsville. In the campaign of 1864 he was mortally wounded at Yellow Tavern, near Richmond, where he attempted to check Sheridan's advance.

STUART, RUTH McENERY (1856–1917), an American story writer, born in Avoyelles parish, La., and educated at Tulane University. She married Alfred O. Stuart, a cotton planter, in 1879, and after 1885 made her home in New York. The original humor of her negro sketches give them a foremost place among stories of their kind. Her writings include *George Washington Jones*, *The Story of Babette*, *The Women's Exchange*, *Sonny*, *The River's Children*, *Amity's Silver Wedding* and *Sonny's Father*.

STUC'CO, a fine plaster, used as a coating for walls, to give them a finished surface. The stucco used for interior decorations is made of pulverized white marble, mixed with water, or of calcined gypsum or plaster of Paris, mixed with glue. That used for external purposes is of a coarser kind prepared with cement. A cheap plaster used for the outside of temporary buildings is called *staff*. The Greeks and Romans used stucco to a great extent, both for internal and external decoration in their buildings, often moulding it into relief designs for friezes and such details.

STURGEON, *stur'jun*, a group of fishes comprising numerous species, found in both fresh and salt waters of the north temperate zone. Some of them are very large, being



STURGEON

ten feet long and weighing approximately 500 pounds. The body is long and slender, terminating in a forked tail, and covered with rows of bony plates. The mouth is comparatively small, funnel-shaped and toothless, and the food, consisting of small marine animals and vegetable growths, is sucked in whole through the thick lips under the long, pointed snout.

The sturgeon is important in the fishing industry. The flesh, which is well flavored, is usually smoked for the market; the eggs are used in the preparation of caviar, and the bladder of the Russian sturgeon is used in making isinglass. Of the numerous species, one of the most familiar is the *common sturgeon*, found in European waters and along the Atlantic coast of North America from Maine to South Carolina. These fish ascend streams in the spawning season and are easily caught, consequently they are not so numerous as formerly. Other species are the *lake sturgeon* of the Great Lakes and Middle West streams; the *white sturgeon* of the Pacific coast of America, the *Russian sterlet* and the *Russian beluga*, the last an enormous fish sometimes weighing 3,000 pounds.

STURM, *stoorm*, JOHANNES (1507-1589), a celebrated educator, born at Schleiden, Prussia. He began teaching at Louvain, afterwards went to Paris, and was then appointed director of the gymnasium at Strassburg, which position he occupied for forty

years. It was in connection with this school that Sturm gained his wide reputation as an educator and reformer. He organized the gymnasium into twelve classes, or grades, extending from the lowest primary to the college, and each of these classes had the work so planned that it prepared for the one next higher. His methods of teaching were clear, practical and forceful, and his course of study was so well planned that the pupils in his school made remarkable progress. The work attracted the attention of educators in every country of Europe, and from Germany the system was transferred to England and was the basis of organization of such schools as Eton and Rugby. From England Sturm's influence extended to America. He is justly considered the originator of what has developed into the graded school system.

STUTT GART, *stoot'gahrt*, GERMANY, the capital of the former kingdom of Württemberg, is situated near the left bank of the Neckar, 115 miles northwest of Munich and thirty-eight miles southeast of Carlsruhe. The surrounding country is exceptionally beautiful, and the city is noted for its broad streets, spacious squares and fine buildings. The most noted structures are the former palace of the king; the old palace, dating from the sixteenth century; the royal library, which has over 400,000 volumes; the Stiftskirche, which dates from the twelfth century, and a Jewish synagogue. The city buildings consist of the industrial museum, the townhall, the hall for the choral society, the art museum, the palace of justice and the polytechnic institute. The educational institutions include a conservatory of music,

an academy of fine arts, a veterinary college and a cabinet of natural history. Among the leading industries are the manufactures of textiles, chemicals, furniture, paper, pianos and chocolate. The city is, next to Leipzig, the greatest center of the German book trade. PETER STUYVESANT Population, 1918, 349,564.

STUYVESANT, *sti've sant*, PETER (1592-1672), a Dutch governor of New Netherlands



(New York), was born in Holland. In 1647 he was made director-general of the colony of the New Netherlands, a position he held until 1664, displaying noteworthy ability and energy in organization and administration. In 1664 the colony fell into the hands of the English and became known as New York. Stuyvesant went to Holland the next year, but soon returned and passed the rest of his life on his farm, called Bouwerij, from which the present Bowery in the city of New York is named.

STYPTIC, *stip'tik*, any substance used in surgery to check the flow of blood from a surface or an orifice. The principal styptics are tannic acid, alum, copper, salts of iron and zinc.

STYX, in Greek and Roman mythology, the name of a river of the lower world, over which the dead were ferried by Charon. Styx was also a rivulet in Arcadia, the water of which was considered poisonous.

SUBMARINE, the boat that Sir Percy Scott of the British navy said would eliminate the battleship, is a boat that travels under water. Before the World War the submarine had received but little consideration, although a few of these boats formed a part of the navies of the principal nations. But within two years from the beginning of the war, the submarine was regarded as the greatest terror of the seas and one of the decisive factors in the conflict.

General Description. A submarine is a steel shell resembling in shape a huge cigar. When floating at the surface it shows an oval back that rises about two and a half feet above the water. Modern submarines are divided into two classes, called coastal and fleet submarines. The general plan of construction is the same for each class, but the fleet submarines are much larger. Coastal submarines are designed for coast defense and are from 150 to 200 feet long, and from fifteen to twenty feet beam. When submerged they displace a quantity of water weighing from 250 to 600 tons. Fleet submarines are designed for longer voyages. They vary in length from 225 to 400 feet, and have a displacement when submerged of 800 to 1,200 tons.

The shell is made of steel plates riveted to a strong steel frame. In the bottom of the boat are a number of compartments which are filled with water when the boat is to submerge. A conning tower rises from the center

of the boat to a height of four or more feet. Such a tower is provided with windows of thick glass, and serves as the bridge for operating the boat. A steering rudder is attached to the stern, and dividing rudders called *hydroplanes* are attached to each side near the bow and stern. These rudders can be inclined



upward or downward, and they direct the boat in diving and rising to the surface. In front of the conning tower is the periscope, which is the "eye of the ship." The speed of a submarine at the surface is from seventeen to twenty-two miles an hour, and when submerged, from nine to eighteen miles.

Equipment. The naval submarine is designed for sinking ships by the means of torpedoes, and the equipment is all planned to this end. The interior is divided into a number of compartments—one is for officers' quarters and another for the men. A number of seamless steel tanks contain air under great pressure, sometimes as high as 2,500 pounds to the square inch. This air is used for forcing water out of the tanks when the boat is to rise to the surface, and for supplying air to the crew. The motors are in the stern, and there is one for each propeller.

When afloat the boat is propelled by an engine which uses crude oil for fuel, and



SUBMARINE, UP FOR AIR

when submerged it is driven through the water by an electric motor that receives its current from storage batteries. The steering gear is similar to that on other ships. On small boats it is operated by hand, but on large ones electric power is used.

The Periscope. The periscope is in front of the conning tower and consists of a tube that can be extended upward about twenty feet, and lowered as the boat nears the surface. A lens fixed in the tube near the top throws a picture of the sea within its field

ONLY THE PERISCOPE SHOWING In time of war the flag is absent.



UNITED STATES SUBMARINE



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CREW OF THE U. S. K-5, LOADING A \$7500 TORPEDO

upon a prism which reflects it down to another prism at the bottom of the tube, where the commanding officer can see it through a glass that closely resembles a field glass. The combination of prisms and lenses is such that the view obtained enables the observer to judge accurately of the location and distance of objects. The entire apparatus can be rotated, so that a view in any direction may be readily obtained. Each modern submarine is provided with two periscopes, one for the commander and one for the helmsman. The gyro-compass shows the direction the boat is taking. This compass consists of a small gyroscope (which see), so mounted that it moves freely on a vertical pivot. The gyroscope when undisturbed will rotate in a plane parallel to the earth's axis; consequently it points directly north and south. The magnetic compass cannot be used because the steel of the ship and the electric currents deflect the needle from its course.

Torpedo Tubes. The torpedo tubes might be called the guns from which the torpedoes are fired. They are usually placed in the upper part of the bow, but they may be placed in the stern or amidships. The outer end of the tube is closed with a water-tight cap which can be opened and closed by a mechanism within the boat. The torpedo is fired by compressed air. The number of tubes a boat can carry depends upon its size. The smallest boats can carry only two. One or more guns for repelling attacks or for attacking also form a part of the equipment.

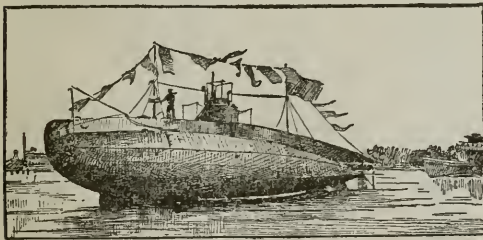
Safety Devices. Each member of the crew is supplied with a safety helmet similar to that used by divers, by means of which he can breathe under water for several hours. Air locks enable men trapped in a damaged compartment to escape to one that is not dam-

safety keel consisting of a keel twelve inches deep, twenty-four inches wide and having a length determined by the weight desired is attached to the boat amid ships. The keel is made of steel plates and is filled with lead. It weighs from five to twenty tons, and is attached to the boat by a device by which it can be instantly released in case of accident. Its release enables the boat to ascend to the surface instantly. In short, all possible precautions are taken for the safety of officers and men, but at best the navigation of a submarine is exceedingly dangerous.

Operation. When a submarine is ready to submerge the tanks are filled, and the boat settles in the water until only the conning tower remains above the surface. The diving rudders are tilted at a slight angle and the motor is started. As the boat moves forward it moves downward. When the desired depth is reached, the diving rudders are changed to a horizontal position and the boat moves through the water at that level. When searching for hostile ships the periscope is kept four or five feet above the water, and if other ships are near, the submarine must move very slowly or the wave caused by the periscope will reveal its location to the enemy. As the ship to be destroyed is approached, a torpedo is placed in the tube, and when the commander has brought his boat into the right position he presses a button and the torpedo is launched.

When a submarine discovers an airplane or a destroyer approaching, it immediately dives to a depth which will assure its safety. The destroyer, which is a swift boat of light draught, armed with rapid-fire guns, whose shells can penetrate its armor, is the enemy most feared by the submarine, for a single shot that pierces the armor is likely to send the boat to the bottom. The small submarines have a steaming radius of about 700 miles; larger boats can travel 5,000 miles from their base.

The Submarine in the World War. Details of the work of the submarine in the World War will be found in the article **WORLD WAR**. It was this war that revealed the power of the submarine as an instrument of destruction, but the war also showed that the submarine was not invincible. That these boats were the only branch of the German navy that was effective during the war, and that they inflicted great loss on the shipping of the allies and on that of neutral na-



LAUNCHING OF THE CUTTLE FISH, U. S. N. aged, and each compartment is provided with an escape hatch. All pumping systems for air and water are duplicated, so that if one is injured another can take its place. A

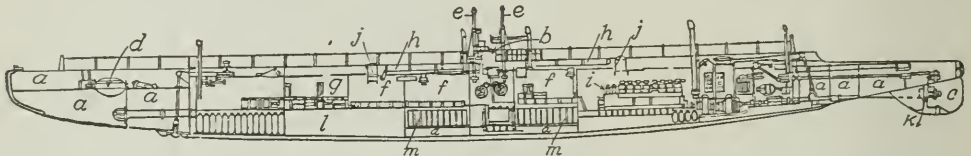
tions is true. But, with all their power for destruction, they were unable to prevent the British navy from keeping the German fleet shut up in the Baltic Sea, thus rendering it wholly ineffective during the entire period of the conflict. For a few months, following Germany's order to sink without warning all ships bound to or from the ports of the allies, large numbers of ships were destroyed, but as soon as England and America were able to put on the seas great fleets of destroyers, the activity of the submarines was checked, and during the last months of the war they accomplished little.

Great Britain, France and the United States all had fleets of submarines, but since

of different navies differ in minor points, they all embody the main features of Holland's design. During the World War the Germans constructed two large submarines for commercial purposes, one of which, the *Deutschland*, made two successful voyages to the United States.

Related Articles. Consult the following titles for additional information:
Submarine Mine Torpedo Boat
Torpedo World War

SUBMARINE MINE, one of the most dangerous and destructive weapons employed in naval warfare, consists of a steel shell charged with a powerful explosive and containing a device for exploding the charge. Submarine mines are so placed in water as to



SUBMARINE

- | | | |
|-------------------|------------------------|-----------------------|
| (a) Ballast tanks | (e) Periscope | (j) Escape hatches |
| (b) Conning tower | (f) Crew quarters | (k) Propeller |
| (c) Rudder | (g) Officer's quarters | (l) Oil tank for fuel |
| (d) Diving rudder | (h) Torpedo tubes | (m) Storage battery |
| (hydroplane) | (i) Engines | |

the shipping of the Central Powers was driven from the seas, there were no ships for these boats to attack, and because of this they were not brought prominently before the public. They were invaluable, however, for hunting and attacking submarines of the enemy in all seas surrounding Europe.

History. During the eighteenth and the early part of the nineteenth century there were several attempts to construct a submarine boat. In 1800 Robert Fulton, then in France, built a number of submarine boats, but they were not practical. During the Civil War the Confederates used a number of submarines propelled by steam engines, as well as some by hand. These boats, called *Davids*, from their smallness as compared to the ships they attacked, were made of old boiler plates, and when advancing to the attack, the top was just under the surface of the water.

The submarine in its present form is the invention of John P. Holland of Paterson, N. J., whose first boat was built in 1877. A Swedish inventor, Nordenfelt, constructed a boat somewhat similar to Holland's in 1866. Both patterns were submitted to the United States government for approval and Holland's was adopted. Although the submarines

destroy or injure any ship which comes in contact with them. Guncotton, which is not injured by water, is the explosive used.

Mines are of three kinds—observation, electro-contact and automatic. Observation mines are placed in harbors or near the shore, and the operator, by switching on an electric current, can explode the mine or group of mines nearest the attacking vessel. Electro-contact mines are constructed in such a way that when they are suddenly tipped to an angle of over 70° a small quantity of mercury is released to complete the circuit between two wires, and the mine explodes. In observation mines no electric current flows until the operator turns the switch; in the electro-contact mines the current is always flowing, but the circuit is not completed until the mine is suddenly hit and tipped over. Both observation mines and electro-contact mines must be anchored so that they are from 5 to 20 feet below the surface of the water. The third class of mines is the automatic, which are just like the electro-contact variety except that the electric current is furnished by dry cells inside the mine. Automatic mines are the only ones which can be used at any distance from shore. They may

be anchored or allowed to drift. In the latter case, they are called *floating mines*.

Mine-Laying. Mines have to be placed with great care, if they are to be effective. Each mine must be located where ships will be most likely to come in contact with it, and its depth must be accurately calculated. Laying the cables to mines that are exploded by batteries on shore is also a delicate operation. The wires connecting the mine with the battery must be strong enough to anchor the mine and of sufficient length to keep the mine at such a depth that it will not be hit by vessels entering or leaving the harbor.

Mine Sweeping. Various devices have been invented for locating and removing mines. Whatever the method employed, ships engaged in this work incur great danger. Figure 1 shows the method in general use previous to 1917. Two vessels are connected by a heavily-weighted cable, which they drag between them. The mines caught by the cable

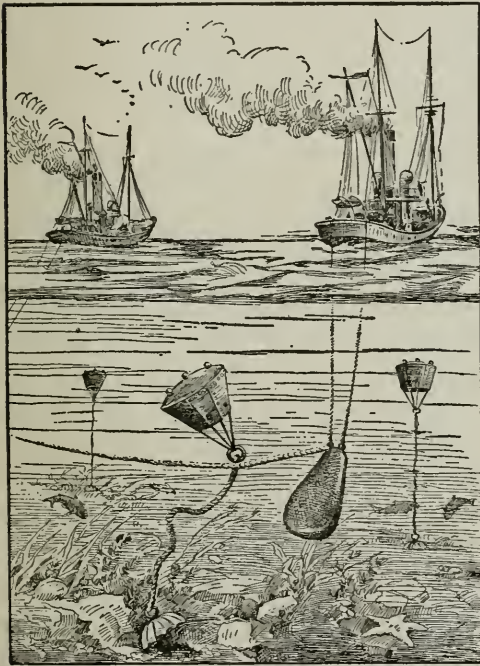


FIG. 1.—“SWEEPING” FOR MINES
Showing the method by which mines may be removed.

are destroyed. Another method of rendering mined waters safe is countermining, that is, by exploding mines in the suspected area. The explosion causes all previously laid mines to explode, and it may detach

mines connected with electric cables and render them harmless.

The latest and most effective device for protecting ships from mines is the *paravane*, invented by Commander Burney of the British navy during the first two years of the World War. The device consists of a pair of steel structures called *otters*, shaped very much like a torpedo, except that they are shorter. A series of serrated steel knives, for cutting the cables holding the mines in position are attached to the front end of each otter. The others are attached to the ship by a tough steel towing-rope about 150

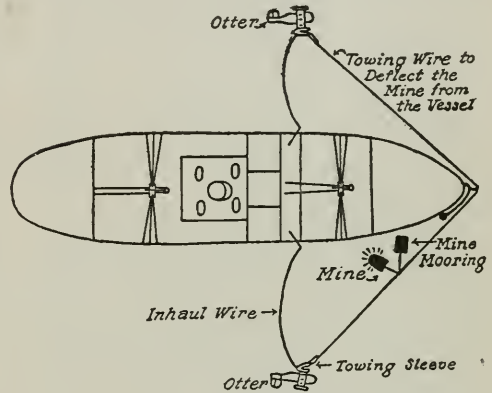


FIG. 2.—THE PARAVANE

feet in length. A large steel plane attached to the other acts in such a way when the ship is in motion as to draw it away from the ship, so that the pair of otters with their towing lines form a huge triangle. When the moorings of a mine are caught by the towing line they are forced along to the otter, where they are cut by the serrated knives; then the mine rises to the surface, and it is easily destroyed. Over 4,000 British and a large number of American ships were equipped with paravanes during the war, and not a ship so equipped was destroyed by a mine.

SUBPOENA, *sub p'ena*, a written notice issued by a court, or an official having judicial powers, commanding a person or persons to appear at a certain time and place and give testimony in a case in court. Failure to comply with the summons constitutes contempt of court. See **CONTEMPT**. The Latin word *subpoena* means *under penalty*. A *subpoena duces tecum* (bring with you under penalty) is a command to appear as a wit-

ness with specified books, papers or other exhibits.

SUBSIDY, in public law, monetary aid granted by a government to an individual or commercial enterprise for the furtherance of a project believed to redound to the public good. Thus, when the Union Pacific Railroad was constructed, the United States government granted the railway corporation tracts of public land along its route as a partial reimbursement for the great sums of money expended in the railroad construction. Aid of this nature extended by a national, state or city government to a private enterprise to assist it in attaining a firm financial basis is known as a *subsidy*; the corporation receiving this financial assistance is said to be *subsidized*.

In international law, subsidy is money furnished by one nation to another to aid it in carrying on a war against a third nation, when such nation does not itself join directly in the conflict.

SUBTRACTION. See ARITHMETIC.

SUBWAY, or UNDERGROUND RAILWAY, a tunnel or system of tunnels constructed in a large city for the purpose of placing a railroad beneath the level of the street to relieve the congestion of travel or freight in the streets. A street is closed partly or wholly and an excavation made to the required depth and width. Floor, walls and roof are then laid and earth is filled in to the street level. After paving, the street is reopened to traffic.

Modern Subways. Many of the world's most progressive cities are adopting the subway system to replace noisy elevated structures which so detract from a city's beauty. London was the first city to construct a subway, and its original model was operated by steam. More modern subways are run by electricity. In Europe, London, Paris and Berlin have developed systems of underground railways to a high state of efficiency.

In the United States, New York, Boston and Philadelphia have overcome surface-car and freight obstructions by means of satisfactory subway systems. Chicago's subways are confined to freight alone, the lines extending for about seventy miles through the hub of the business district. However, in the not far distant future that city, too, will solve its surface-car congestion problems by the construction of a comprehensive system of rapid-transit tubes.

New York's subway is the most extensive of the world's systems. A large part of it is arranged with four tracks to accommodate express and local trains, which have from six to ten coaches each. The subway is owned by the municipality, and it is leased for operation to a private company. The cost of construction per mile of the New York system averaged \$2,000,000; at times to overcome obstructions it required an outlay totaling \$5,000,000 per mile, exclusive of equipment. It is estimated that on an average 3,000,000 passengers daily take advantage of this means of rapid-transit in that city. The subway is another of the many engineering feats of modern life which prove man's supremacy over the forces of nature in his endeavors to conquer time.

SUCCESSION, *suk sesh'un*, WARS, wars which have arisen from conflicting claims for the possession of a crown. In modern European history the most important of these struggles were the War of the Spanish Succession (1701-1714), the War of the Polish Succession (1733-1735), the War of the Austrian Succession (1740-1748) and the War of the Bavarian Succession (1778-1779).

The War of the Spanish Succession. Shortly before the death of Charles II of Spain, who had no direct heirs, several competitors laid claim to the throne, chief of whom were Louis XIV of France, son of the eldest sister of Philip IV, and Emperor Leopold of Austria, son of a younger sister of Philip IV. The other powers were greatly interested in this question, since the union of either France or Austria with Spain would have endangered the balance of power in Europe. After much negotiation Philip of Anjou was put forward by Louis XIV to represent the French claim, and Leopold nominated his second son Charles as his substitute, both declaring that Spain should never be incorporated with their respective dominions. The king of Spain eventually recognized Philip as his heir, and on the king's death, in November, 1700, Philip was proclaimed king at Madrid. He was recognized by most of the European powers except Austria, which in the following year declared war against France.

However, the arrogant and aggressive behavior of Louis, his recognition of the son of James II as king of England and his declaration that the accession of Philip to the

Spanish throne did not prevent his succession in France, caused England, Holland and Austria to combine against him and Philip in 1702. Prince Eugene of Austria had already opened the contest and had won some victories over the French. In 1702-1703, Marlborough, at the head of an allied army, reduced the French strongholds along the Meuse and in the Low Countries; in 1704 he joined his forces with Eugene, and together they defeated the Franco-Bavarian army at Blenheim. Barcelona was captured by an English force in 1705, and the earl of Peterborough gained some brilliant successes in this quarter. In 1706 the French were defeated by Marlborough at Ramillies, and by the Austrians at Turin. By 1707 the French and Spanish had driven the allies out of Spain, but in the following year Marlborough and Eugene reunited their forces and severely defeated the French at Oudenarde.

The resources of France were now crippled, and Louis made overtures of peace, which were rejected. The struggle was renewed with great vigor; Villars proceeded against Marlborough and Eugene, but he was defeated by the allies at Malplaquet in September, and matters continued to look very unfavorable for Louis. The war dragged on until the accession of the Archduke Charles to the Austrian throne changed the whole aspect of affairs, and the struggle, so far as Great Britain, France and Holland were concerned, was brought to an end by the Peace of Utrecht in 1713. Peace between Great Britain and Spain soon followed, the former gaining Gibraltar and Minorca; and in 1714 the emperor, Charles, forsaken by his allies, was reluctantly compelled to sign a treaty at Baden, recognizing Philip V as the king of Spain.

The War of the Polish Succession. When the Polish nobles elected as king of Poland Stanislas Leszezynski, father-in-law of Louis XV of France, they clashed with the interests of Russia and Saxony, who were determined that Augustus, elector of Saxony should be king. France was unable to keep Stanislas on the throne, and Augustus III was recognized king of Poland.

The War of the Austrian Succession. This arose on the extinction of the male line of the House of Hapsburg, by the death of Emperor Charles VI in 1740. By diplomatic negotiations before his death and by means

of the settlement called the Pragmatic Sanction, Charles had endeavored to secure the Austrian succession for his daughter, Maria Theresa. But there were several other claimants for the Austrian possessions, which included Bohemia, Hungary, northern Italy, part of the Netherlands and Austria proper. Besides Maria Theresa, the other claimants of importance were Charles Albert, elector of Bavaria, and Philip V of Spain; while the chief European powers which took an interest in the succession were France, Prussia and England. The first movement was made by Frederick II of Prussia, who, in December, 1740, marched his army into Silesia and secured that province as his share of the spoil. In the following year an agreement was entered into between France, Spain, Bavaria, Prussia, Saxony, Sardinia and Naples, by the terms of which a French-Bavarian army entered Upper Austria, another French army invaded the Austrian possessions in the Netherlands, and the forces of Spain and Naples occupied the Austrian territory in northern Italy. This having been done, the coalition arranged that Charles Albert should be crowned as emperor of Germany, under the title of Charles VI, and this was accomplished at Frankfurt.

Meanwhile, Maria Theresa appealed for help to the Hungarian Diet, with such effect that a Hungarian force promptly invaded Bavaria and captured the city of Munich. She also formed an alliance with England, in accordance with which the English government furnished her with money, sent a fleet to Naples to demand the withdrawal of Neapolitan troops from Austrian territory, and supplied a portion of the army which defeated the French forces at Dettingen (1743). After this event negotiations for peace were begun, but with so little success that another league was formed, including England, Holland, Austria, Saxony and Sardinia, and a general European war broke out. Among the more important events of this general conflict were the Second Silesian War, begun by Frederick II; an attempted invasion of England by France, in favor of the Pretender, and the brilliant campaign in the Netherlands conducted by Marshal Saxe, terminating (May, 1745), in the victory of Fontenoy, where the English and allies were defeated. In 1745, however, Emperor Charles VII died, and his son, Maximilian Joseph, gave up all claim to the

Austrian throne and concluded peace with that country; in the same year the husband of Maria Theresa was elected emperor, under the name of Francis I. War was still continued against Austria by the French forces under Marshal Saxe, but ultimately a definite treaty of peace between all the powers was signed in 1748 at Aix-la-Chapelle.

The War of the Bavarian Succession. The Elector Maximilian Joseph of Bavaria died without legitimate issue in 1777, and Charles Theodore, the Elector Palatine, succeeded him. Charles also was without legitimate heirs, and in 1778 he made an agreement with Austria whereby Lower Bavaria was to be transferred to Austria and the natural children of Charles were to have the status of princes of the empire. The next heir, Charles, Duke of Zweibrücken, protested, and was supported by the king of Prussia. This brought on the war of the Bavarian Succession, which was settled by compromise before any serious fighting took place.

Related Articles. Consult the following titles for additional information:

Aix-la-Chapelle,	Frederick II
Treaties of	(the Great)
Blenheim	Louis XIV (France)
Charles VI	Maria Theresa
French and Indian	Marlborough,
Wars	Duke of
	Pragmatic Sanction

SUCKER, a name applied popularly to several fish because of the manner in which they use their mouths in eating. The best known is the *common sucker* of the streams and lakes of North America. There are several species, none of which is very large. All have roundish mouths on the lower side of the head, and thick, puckered lips, with which they suck up food from the mud of the bottom. In some places they are very abundant, but, because they have numerous small bones, they are not much eaten.

SUCRE, *soo'kra*, the official capital of the republic of Bolivia, known locally as *Chuquisaca*. Though it is the official seat of government, the sessions of Congress are held at La Paz, a city 300 miles northwest. However, at Sucre is the Supreme Tribunal of Justice.

The city is situated on a plateau, about 9,000 feet above the sea, on a small branch of the Pilcomayo River. The principal industries of the vicinity are mining and agriculture, the latter the more important. Places of interest are Saint Xavier University, the oldest university in South America, a fine

cathedral and the President's palace. The city was settled in 1536 by the Spaniards, who called it La Plata. It was the scene of the declaration of Bolivian independence in 1825, and later was named Sucre in honor of the republic's first President. Population, 1915, estimated, 29,686.

SUDAN, or **SOUDAN**, *soo dahn'*, an extensive region in the central part of Africa, south of the Sahara. Its boundaries are indefinite, but it extends from the Sahara Desert in the north to the Congo Free State on the south, and from the French Senegambia on the west to Egypt.

European Protectorates. The region is inhabited by negro and Arab tribes, but since 1902 it has been placed under the protection of European powers. The eastern part, or Anglo-Egyptian Sudan, is a protectorate of Great Britain. This section is divided into fifteen provinces, and their governors are either British officers of the Egyptian army employed under the Sudan government, or are British civil officials. Darfur, a district within the limits of the English Sudan, is still ruled by its hereditary sultan. Anglo-Egyptian Sudan covers an area of about 1,014,400 square miles; its population in 1917 was estimated at 3,400,000. Its chief towns are Khartoum, Omdurman and Port Sudan.

The western section is under French influence, and comprises six colonies, notably Senegal, French Guinea and Dahomey. These colonies are each under a lieutenant-general of all the colonies. French West Africa covers an area of 1,478,000 square miles, with a population estimated in 1915 to be 12,438,567. English and French influences have been very effective in the development of the Sudan and the enlightenment of its people.

Topography. Sudan contains lofty mountains and broad plains, which are in some places nearly void of vegetation and in others interspersed with patches of forest and open country. Other localities are characterized by high plateaus. The loftiest mountain range is the Adamawa, whose highest summit is 10,000 feet above the sea. Much of the Sudan is covered with a luxuriant growth of vegetation. The climate is hot, and in the lowlands along the coast and streams it is extremely unhealthful for Europeans.

Production and Commerce. The Sudan is the chief source of the world's supply of gum arabic and ivory. Cotton, sugar, rice, ba-

nanas, dates and other tropical fruits are raised and exported. From the dense jungles of Lake Chad, inhabited by wild elephants, come most of the world's supply of ivory.

In the eastern section, where there is less vegetation, cattle, camels, sheep and ostriches are raised; the ostrich feathers from this region are famed. Gold is the only mineral which at present is being mined with any degree of success, although iron and silver are present in abundance.

SUDAN GRASS, a hay grass introduced by the Federal Department of Agriculture into the United States in 1909 from Khartum, Sudan. The excellent results of the initial test in Texas were so encouraging that thousands of acres were subsequently planted in the South and Southwest, in humid as well as in irrigated areas.

Sudan grass has no perennial rootstock, which eliminates the danger of its becoming a pest. It is cultivated annually from seed as a forage plant as well as for its seed, is one of the best drought-resisting plants known to the American farmer, and thrives in almost any soil. The first crop matures in from sixty to eighty days; and from two or three cuttings of hay are obtainable each year, depending on the region where it is planted. In Hawaii it is considered one of the most successful grass introductions ever made.

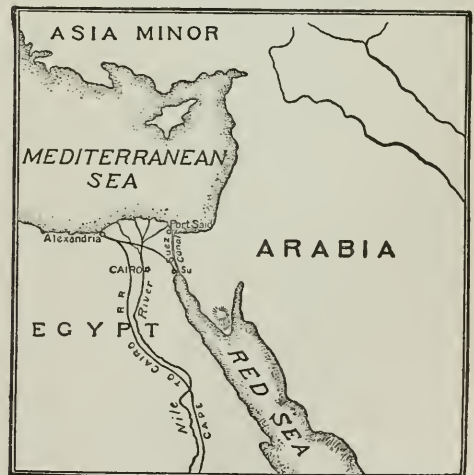
SUDERMANN, HERMANN (1857-), a German novelist and dramatist, born at Matz-sicken, East Prussia. After studying at the universities of Königsberg and Berlin, he became a tutor, later a journalist, and in 1887 published his first collection of stories. In the following year he wrote the novels *Dame Care* and *Regina* and the drama *Honor*, the last of which brought him fame. *Magda*, his greatest drama; *The Joy of Living*, a powerful play dealing with the struggle between natural selection and marital obligation; and *Es War*, a psychological novel, are representative. They are among the most significant productions in present-day German literature, and are remarkable alike for the ideas they embody, for style and for the virile picture of humanity they present. Important works not already mentioned are *John the Baptist*, *The Song of Songs*, *The Undying Past* and two collections of one-act plays entitled respectively *Roses* and *Morituri*.

SUE, su, MARIE JOSEPH EUGENE (1804-1857), a French novelist. He inherited a large fortune from his father, a surgeon in Napo-

leon's army, and after studying medicine and practicing for a time, he settled at Paris and devoted himself to literature. His first work was a sea novel, *Kernock, the Pirate*. This was quickly followed by *Plick and Plock*, *Atar-Gull*, *The Salamander* and the *Lookout of Koatven*. Sue wrote some historical fiction, but his most famous works are *The Mysteries of Paris* and *The Wandering Jew*, books dealing with the mysterious and supernatural. His later novels are *The Foundling*, *The Seven Capital Sins* and *The Mysteries of the People*. In 1850 Sue was elected to the Constituent Assembly as an advanced radical.

SUEZ, soo ez', a seaport situated at the head of the Gulf of Suez, seventy-six miles east of Cairo, with which it is connected by rail; it is also at the northern end of the Suez Canal. Despite the improvements which the opening of the canal brought in its train, as well as its increased population and apparent commercial importance, Suez has remained dirty and unattractive. It has never regained its former position as a prosperous trade center for the Orient, as it is but little affected by the vast commerce of the canal. Most of the houses are built of sun-dried brick. The city contains a number of mosques and, in the European quarter, several substantial hotels, warehouses and modern structures. Population, 1917, 31,000.

SUEZ CANAL, a ship canal across the Isthmus of Suez, connecting the Mediter-



THE SUEZ CANAL

anean with the Red Sea. It extends from Port Said, on the Mediterranean, to Suez, on the Gulf of Suez, a distance of one hun-

dred miles, and is the longest ship canal in the world. About sixty miles of the channel is through shallow lakes. It is a sea-level canal and has no locks. Work on it was begun in 1859, and the structure was completed in ten years. The original expense was about \$95,000,000.

The Suez Canal was undertaken and carried to completion under the direction of Count Ferdinand de Lesseps, a French engineer. Its construction shortened the sailing distance between England and India more than 5,000 miles, and it has materially increased the traffic between European and Asiatic countries. The canal is lighted by electric lights, so that ships can navigate it by night as well as by day. About 4,000 vessels pass through it each year, and the annual tolls amount to about \$25,000,000. It is under the management of an international commission and in times of peace is open to ships of all nations on equal terms. During the World War Germany made several attempts to destroy the canal and thus cripple Great Britain, but the efforts failed. See CANAL.

SUFFRAGE, *suffraje*, in a representative government, is the act or right of a qualified voter to participate in the election of officers or in the making or approval of laws by the initiative and referendum. The general idea of suffrage is traced to the origin of the jury system. The principal qualifications now required for suffrage are intellectual ability, property possession, moral character and residence. Not all states lay such restrictions, and no state requires all of them.

Suffrage in the United States. At various times in all sections of the United States all the above restrictions were in force, with the addition of religious affiliation. In colonial days less than one-fourth of the men were given the voting power, because of religion and property qualifications and religious distinctions. These bars were gradually lifted. The Federal Constitution has always recognized the right of each individual state to decide upon whom the right to vote shall be conferred, but specifically specifies that "race, color, or previous condition of servitude" shall not disqualify any citizen of his right of franchise.

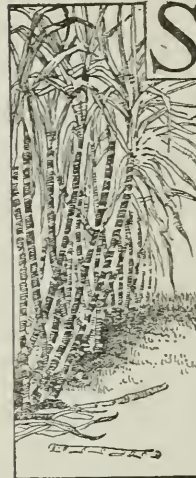
The attainment of the age of twenty-one years is a qualification for voting in every state. Except in a few states where, for local reasons, special educational and proper-

ty tests are exacted, universal manhood suffrage exists in every state in the Union. An amendment to the Constitution granting suffrage to women passed both houses of Congress in 1919 and awaited ratification by the requisite number of state legislatures.

Related Articles. Consult the following titles for additional information:

Australian Ballot
Ballot
Election

Short Ballot
Woman Suffrage



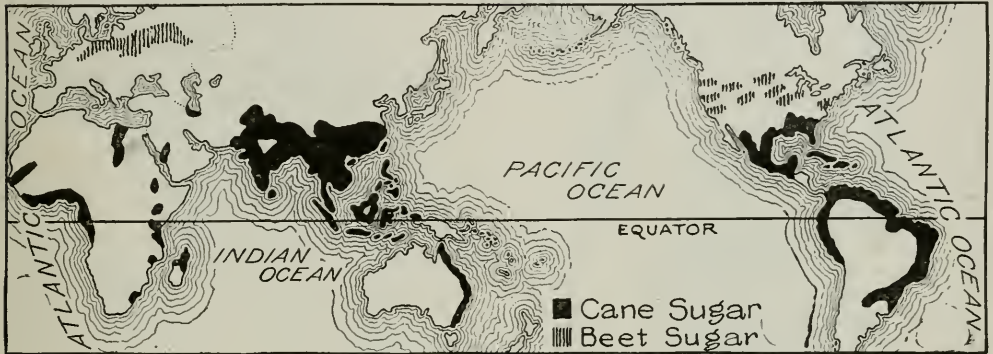
SUGAR, one of the most essential articles of food, is found in the juices of many plants, but in only a few in sufficient quantities to make its extraction commercially profitable. These are sugar cane, sorghum, the sugar beet and the sugar maple. Small quantities are sometimes obtained from the cocoanut and other palms. The sugar of commerce is practically all obtained from sugar cane and beets.

Cane Sugar. This is prepared from the sugar cane. The leading countries in the production of this plant are Cuba, Java, Porto Rico, Brazil, Argentina and certain sections of the United States, particularly Louisiana and Hawaii. The cane found in the tropical regions is the richest in sugar. That of the West Indies furnishes about 225 pounds of sugar to a ton of cane, while that from Louisiana yields only about 160 pounds. In the manufacture of sugar the cane is first crushed between heavy rollers, which press out the juice. The rollers are in two or three sets, called *mills*, each mill so adjusted that it presses the cane harder than the one before it. As the crushed stalks pass from one mill to another, they are moistened with water of varying temperature, in order that the remaining juices may be liberated; the crushed stalks, or *bagasse*, are used for fuel under the boilers. By this process about nine-tenths of all the cane sugar is manufactured. The juice is immediately treated with sulphurous acid gas, and it is then mixed with lime; the gas bleaches it and permits excessive liming, which materially aids in the clarification of the juice and prevents the

separation into grape sugar and cane sugar. The juice is then filtered, after which it is ready for reduction by evaporation.

For the first sugars, the juice, after being reduced to a syrup in evaporators, is boiled at a low temperature in vacuum pans until the water is all driven off and crystallization takes place, forming a *masscuite*, which is pure sugar mixed with a small per cent of syrup. This *masscuite* is dropped into a mixer, where it is stirred and kept from caking by revolving paddles. From the mixer it is fed to revolving cylinders called *centrifugals*, on the sides

sections in the tropical and semi-tropical regions. Beets, on the other hand, thrive in temperate regions and over a much wider area. The manufacture of beet sugar was one of the important industries in France and Germany before the World War, and it was suspended only during the period of that conflict. Sugar beets are successfully grown in a number of the states of the United States and the quantity of beet sugar manufactured in that country is increasing from year to year. Michigan, Colorado, Nebraska, California and Arizona are among the leading states engaged in the industry. In the manufacture



SUGAR PRODUCING REGIONS

of which is a basket of wire netting. As the cylinder revolves at a high rate of speed the *masscuite* is washed, the amount of washing varying with the quality of the sugar manufactured. The liquid portion is forced out through the meshes of the basket, and this, after several reboilings, constitutes the molasses of commerce. The solid crystals of sugar are left within the centrifugal. The sugar is then dropped on to conveyors and taken to the granulator to be thoroughly dried, the granulator being a revolving cylinder heated by steam, through which the sugar is fed by gravity. Sugar thus made is placed on the market as *granulated sugar*. *Loaf sugar* is made by packing the fresh sugar in molds, where it is allowed to form blocks, which are sawed to the desired shape. Cheaper grades of sugar, known as seconds and thirds, are made from the syrups taken from the first sugars. The first is placed on the market as *coffee sugar*, and the latter is known as *brown sugar*; both are sold principally to the large refineries.

Beet Sugar. Climate and soil limit the area in which sugar cane can grow to certain

of beet sugar the diffusion process is used. The beets are first sliced by machinery, then placed in iron cells, where a constant circulation of water is kept up, the juice being drawn from the cell holding the fresh chips, and the fresh water being introduced into the last of a series of cells, just before dropping the chips. The liquid thus obtained is first treated with carbonic acid gas; it is then mixed with lime, after which carbonic acid gas is forced through it a second time. The gas combines with the lime and other impurities and causes them to settle at the bottom of the tank. The liquid is then passed through bag filters, when it is ready for evaporation. The remaining processes are the same as those used in making cane sugar. A ton of beets will make from 320 to 400 pounds of sugar. The waste chips are fed to cattle.

Maple Sugar. Maple sugar is obtained from the sap of the sugar, or rock, maple and it is highly prized on account of its delicate flavor. The sugar season begins in the spring, as soon as the sap commences to circulate in the trees. The sap is obtained by boring a small hole in the trunk of the tree, from an

Outline and Questions on Sugar

I. SOURCES

- (1) Sugar Cane
 - (a) Where grown
 - (1) United States
 - (2) Other countries
 - (b) Description
 - (1) Height
 - (2) Leaves
 - (3) Resembles what plant?
 - (c) Sugar mills
 - (1) Processes
 - (2) Crushing stalks
 - (3) Reduction of sap
 - (4) Refining, etc.
 - (d) Products
 - (1) Granulated sugar
 - (2) Loaf sugar
 - (3) Brown or raw sugar
- (2) Beets
 - (a) Where grown
 - (1) United States
 - (2) Other countries
 - (b) Sugar factories
 - (1) Processes
 - (2) Slicing beets
 - (3) Drawing juice
 - (4) Refining, etc.
- (3) Maple Sap
 - (a) Where produced?
 - (b) Season
 - (c) Securing sap
 - (d) Sugar-making (see sugar cane)
 - (e) Flavor, value, etc.
- (4) Sorghum
 - (a) Resembles what plant?
 - (b) Process (see sugar cane)
 - (c) Product
 - (1) Syrup
 - (2) Sugar—not of commercial importance

II. SUGAR REFINERIES

- (1) Location of
- (2) Work of refining
- (3) Annual output of cane sugar, beet sugar
- (4) United States
 - (a) Annual output of cane sugar
 - (b) Annual output of beet sugar
 - (c) Annual consumption of sugar

- (d) Annual importation of sugar
- (e) Annual consumption of individual.

III. BY-PRODUCTS

- (1) Molasses and Syrups
 - (a) Sorghum
 - (b) New Orleans molasses
 - (c) Foundation for all syrups
- (2) Bagasse
- (3) Beet chips

Questions on Sugar

How many pounds of sugar are made from a ton of beets? From a ton of West India cane? Louisiana cane?

What is the sugar you use daily made from—beets, sugar cane or maple sap?

How is loaf sugar made?

In what cities are some of the sugar refineries located in the United States?

What are the chief uses of maple sugar?

What is sorghum? Why is not the cane suitable for sugar?

What do we mean by raw sugar? Brown sugar?

What countries lead in the raising of sugar cane?

How does the cane in the tropics compare with that of cooler climates?

What becomes of the crushed stalks?

Upon what does the growth of the sugar cane depend largely?

For how long a period does one planting last? Is this an important factor?

What is done with the beets after extraction of the sugar? With the cane stalks?

What color is the raw sugar? What is used to whiten it?

Is a maple tree injured by tapping for its sap?

Why can cane sugar not be grown in cool climates?

Is there extensive production of sugar beets in any country except the United States?

Is any sugar cane grown on the continent of Europe?

Will cane for sorghum grow farther north than sugar cane?



1



4



2



5



3



6



7

SUGAR

1, Sugar Beets.
2, Blossom, Sugar Cane, enlarged.

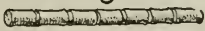
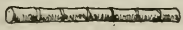
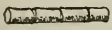


3, Leaf of Sugar Cane.
4, Leaf and Fruit, Sugar Maple.
5, Blossom, Sugar Maple.

6, Maple-Sugar Orchard.
7, Sugar Cane.





inch to an inch and a half deep, placing in this an iron spile, containing a hook, to which a bucket is attached. The sap drips through the spile into the bucket. The sap is collected and evaporated in the sugar houses, constructed specially for the purpose. The evaporating apparatus is constructed on such a plan that the sap flows in at one end and the syrup flows out at the other. Four gallons

ing a thick layer of animal charcoal. The filter removes the coloring matter. The syrup is collected underneath the tanks and boiled in vacuum pans, until the water has been driven off and crystallization takes place. The mass-cuite is then treated the same as that from cane and beet sugar in the preparation of granulated sugar. The largest sugar refineries in the United States are located in New York, New Orleans, Philadelphia and San Francisco.





Cane Sugar

Cuba		2875
British India		2704
Java		1578
Hawaii		579
Porto Rico		381

Beet Sugar

Germany		2911	Russia		1521
Austria		1340	France		879

Maple Sugar

Quebec		7	Vermont		4
Ontario		2½	New York		2

Figures represent thousands of short tons.

SUGAR PRODUCTION

The source of the greater proportion of three kinds of sugar.

of sap make a pound of sugar. Maple sugar is placed on the market in the form of syrup and sugar. It is now used only as a delicacy and commands a very high price. The leading states in its production are Vermont, New York and Ohio. The province of Quebec now holds the first place in the production of this delicacy.

Sorghum. This is a variety of cane used in the manufacture of syrup. It will grow in much cooler climates than sugar cane, but the amount of sugar obtained from it is not sufficient to be worthy of consideration, when compared with the sugar made from cane and beets. The sap is suitable for the manufacture of syrup only, and the process used is similar to that employed in the manufacture of cane sugar.

Refining. Much of the sugar imported into the United States is received in the crude form, known as *raw* sugar. This is dissolved in water to which a small quantity of lime has been added. This solution is then heated by steam and passed through filters which consist of deep vats with perforated bottoms contain-

When young the plant presents a fresh, green appearance, but as it matures some of the leaves turn a purplish hue, and those at the bottom turn yellow, wither and fall off. The illustration in the color plate is of a mature plant, such as grows in the tropics. Further north the sugar cane is a forced plant and does not blossom.

Sugar cane is grown extensively in the tropical regions of Asia, Cuba and other West Indian Islands, Hawaii and Louisiana and to a less extent in several countries of Europe and the other Gulf states. The soil should be very fertile and carefully prepared. In this country the soil is plowed and thrown up into ridges from five to seven feet apart. A deep furrow is plowed in the top of the ridge, and the cane is laid on this for covering. The best results are obtained by planting only the upper joints of the cane. Two or three cuttings may be laid side by side in the furrow. The cane is covered with a plow and sometimes the ground is rolled. In Louisiana it requires about eight months for the crop to mature. During growth the land is frequently cultivated to keep it free from weeds and to prevent evaporation.

At harvest time the cane is cut about two inches from the ground and stripped of leaves. The top is then cut off and the stalks are piled in rows for hauling to the factory. In Cuba and other tropical countries where there is no danger from frost, the crop is allowed from ten to eighteen months in which to mature. Small crops are obtained from one planting, but the first crop is the most valuable and for good results the field should be replanted every third year. See SUGAR.

SUICIDE, *su'i cide*, the act of intentionally taking one's own life. Statistics on suicide are by no means complete; for, owing to the ignominy which society attaches to the deed and, in places, to the law's manner of dealing with it, many cases of suicide are not reported as such. The records available present such an unaccountable array of facts as to make them merely interesting. It is shown that four males commit suicide to one female; most of them between the ages of fifty-five and sixty-five; that single people have a stronger tendency than married persons to self-destruction. It seems that suicides are much more frequent among civilized than among barbarous peoples; and that among the former the highest percentage of suicides are in the ranks of those who work with their heads rather than with their hands. The professions, the arts, business administration and the army claim a large percentage.

These facts go to show that suicide is not an indication of mental weakness, and the conclusion is further supported by the lives of some of the world's greatest men who committed suicide or contemplated it. That country which shows the highest percentage of suicides is Saxony; the lowest, Ireland. Undoubtedly if there were records for comparison it would be found that suicides among Asiatics are more frequent than among Western peoples, Christianity being a deterrent influence, while some Eastern religions have favored self-destruction. Until very recent times the laws of China and Japan permitted a certain class of criminals to perform their own execution by "hara kiri" (which see).

The manner of ending one's life seems to depend largely on environment. In cities death by gas or jumping from high buildings is not unusual; in warm countries drowning is most frequently resorted to. Poisoning and shooting are frequent means to the end sought.

The facts as stated point to no external cause of suicide, but indicate, rather, individual reaction to circumstance. Despondency is a chief cause of suicide in America. Jealousy drives many to suicide; brooding over religion is also a cause. In general, it may be stated that lack of intellectual diversion is one of the most frequent causes of suicide. The person who has healthy interests and who cultivates an altruistic attitude towards his fellows, is not likely to die by his own hand.

SULEIMAN II, *soo'lah mahn*. See SOLYMAN II.

SUL'LA, LUCIUS CORNELIUS (138-78 B. C.), a Roman statesman and general. He served with distinction under Marius in the Jugurthine and Cimbrian wars and was chosen praetor. For his services in the Social War, he was appointed consul in 88 B. C., and the Province of Asia with the conduct of the war against Mithridates, fell to his lot. Marius also wanted this command, and to carry his point he resorted to acts of violence, by which Sulla was compelled to escape from Rome. But Sulla reentered the city at the head of his army, drove Marius to Africa and then sailed for the East at the beginning of 87 B. C. He expelled the armies of Mithridates from Europe, crossed into Asia and was everywhere victorious, gaining wealth for himself and his soldiers and forcing Mithridates to conclude a peace. Sulla now hastened to Italy, where, although Marius was dead, the Marian party was still strong, and after a number of combats, he entered Rome in triumph in 82. He put to death thousands of his enemies throughout Italy, had himself declared dictator and then ruled without restraint, repealed and made laws, abolished the tribuneship and settled his veterans in various parts of Italy. In 79 he laid down his dictatorship and spent the rest of his life in retirement. See MARIUS, CAIUS.

SUL'LIVAN, ARTHUR SEYMOUR, Sir (1842-1900), an English musician, born in London. He completed his musical education at the Royal Academy of Music. In 1858 he went to Leipzig, and on his return, in 1862, he at once attracted attention by his music to Shakespeare's *Tempest*. He wrote several oratorios and many songs and anthems, one of the most famous being *The Lost Chord*. Perhaps his most popular compositions were the burlesque operettas which he produced in collaboration with W. S. Gilbert. Among the

most popular are *Pinafore*, *Pirates of Penzance* and the *Mikado*. One of his finest compositions was written for an arrangement of Longfellow's *Golden Legend*. He was knighted in 1883.

SULPHATES, *sulfate's*, salts of sulphuric acid. Of the sulphates, some are very soluble, some sparingly soluble and some insoluble. The most important sulphates are sulphate of aluminum and potassium, or alum; sulphate of ammonium, employed for making carbonate of ammonia; sulphate of copper, or blue vitriol, much used in surgery and in dyeing, and for preparing certain green coloring matters; sulphate of iron, or green vitriol, used in making ink and very extensively used in dyeing, in calico printing and in medicine; sulphate of manganese, used in calico printing; sulphate of quinine, much used in medicine; sulphate of zinc, or white vitriol, used in surgery, in the preparation of drying oils for varnishes and in calico printing.

Related Articles. Consult the following titles for additional information:

Alum	Epsom Salt
Barium	Glauber's Salt
Blue Vitriol	Gypsum
Calcium	Strontium
Calomel	Sulphuric Acid

SULPHUR, one of the non-metallic elements, easily recognized by its light yellow color and peculiar odor, often experienced in the burning of a match. Because of the low temperature at which it burns it was formerly called *brimstone*, which means *burn stone*. Sulphur has been known from the earliest ages. It occurs in a pure state, in beds of gypsum or clay, usually in volcanic regions. It also forms many compounds, some of which are valuable ores as pyrite, sulphide of iron, galena, sulphide of lead and cinnabar, or sulphide of mercury. Pure sulphur is commonly met with in two forms—as a compact, brittle solid, and as a fine powder. It is nearly tasteless, and when rubbed or melted it emits a peculiar odor. It is insoluble in water and is not very readily soluble in alcohol, but it is taken up by spirits of turpentine, by many oils and by carbon disulphide. It is a non-conductor of electricity and is readily melted and volatilized; it melts at 232° F., and between 232° and 280° it possesses the greatest degree of fluidity. It possesses the peculiar property of solidifying at a higher degree, or when raised to 320°. From 480° to its boiling point (792°) it again becomes fluid, and at 792° it rises in vapor, which condenses

in close vessels in the form of a fine, yellow powder, called *flowers of sulphur*. The roll sulphur of commerce is made by pouring melted sulphur into cylindrical molds, where it is cast.

Where Sulphur is Found. Formerly nearly all the sulphur of commerce came from Sicily, where there are large deposits in a pure state; but a few years ago a valuable deposit of pure sulphur was discovered in Calcasieu Parish, Louisiana, and now Louisiana leads in the production. The deposit covers an area of seventy acres, is 110 feet thick and lies from 100 to 150 feet below the surface. This bed lies in the midst of an extensive alluvial region and bears testimony to the tremendous volcanic activity of some remote geological era. In extraction the sulphur is melted with compressed steam; then the melted portion is pumped to the surface, where it is allowed to cool in large masses, which are broken up and loaded on to cars. Sulphur is also found in various places in Italy, in the Caucasus, in upper Egypt, Japan, New Zealand and several other places.

Compounds of Sulphur. Besides the ores mentioned above sulphur forms a large number of compounds, some of which are extensively used in the arts. When burned in the air it unites with oxygen, forming *sulphur dioxide*, a colorless gas with a suffocating odor always associated with burning sulphur. When moist this gas bleaches vegetable colors, and it is used in bleaching such fabrics as chlorine and other bleaching agents injure.

Hydrogen sulphide, or as it is more commonly called, sulphureted hydrogen, is the gas usually found in the water of sulphur springs, and is readily recognized by its disagreeable odor.

Carbon disulphide is a volatile liquid, with a poisonous vapor, produced by the action of sulphur upon carbon at high temperatures. It is used for dissolving rubber and gutta-percha, for extracting essential oils from plants and seeds and for extracting bitumen from minerals.

Ferrous sulphate, commonly known as *copperas*, or *green vitriol*, is extensively used in dyeing and in the manufacture of pigments and ink. *Copper sulphate*, or *blue vitriol*, is the most useful compound of sulphur and copper. It is used extensively in electric batteries, in electroplating, in calico

printing and dyeing, and for preserving timber. But the most useful of all compounds of sulphur is *sulphuric acid* (which see).

Uses of Sulphur. The most extensive use of pure sulphur is in the manufacture of sulphuric acid. Next in importance is its use in the manufacture of gunpowder and other explosives, and in fireworks. It is also extensively used in vulcanizing rubber. In medicine it is used internally as a laxative and as a remedy in rheumatism. It is used externally as an ointment in certain skin diseases. Sulphur is an important ingredient of the human system; it is estimated that the body of a healthy adult contains about one-fourth pound of it in combination.

SULPHURETED HYDROGEN, *sul'fu ret ed hi' dro jen*, or **HYDROGEN SULPHIDE**, *sul'fide*, a colorless, inflammable gas, a compound of sulphur and hydrogen. It occurs in some mineral waters and as a volcanic gas, and forms wherever albuminous substances containing sulphur are allowed to decompose. In the laboratory it is produced by causing sulphuric or hydrochloric acid to act on iron sulphide. It gives to water a sweetish taste and to air the odor of rotten eggs. The gas is very poisonous, and even a little of it in the air is dangerous when breathed. When mixed with one and one-half volumes of oxygen and ignited it explodes. A strip of filter paper soaked in a solution of lead acetate on exposure to the gas turns brown or black. This is a good test to discover the presence of the gas. Sulphureted hydrogen is extensively used in analytical chemistry.

SULPHURIC, *sul fu'rik*, **ACID**, the acid most extensively used in the arts, is a compound of sulphur trioxide and water. Pure sulphuric acid is a dense, oily, colorless fluid, exceedingly acid and corrosive, decomposing all animal and vegetable substances by the aid of heat. It unites with alkaline substances and separates most of the other acids from their combinations with the alkalis. It has a very great affinity for water and unites with it in every proportion, producing great heat; it attracts moisture strongly from the atmosphere, becoming rapidly weaker if exposed. The sulphuric acid of commerce is never pure, but it may be purified by distillation. With bases, sulphuric acid forms salts called sulphates, some of which are neutral and others acid. A very strong form of sulphuric acid, known as *Nordhausen acid*,

is prepared by heating green vitriol in closed vessels. It is chiefly used in the arts for dissolving indigo.

Uses. Sulphuric acid is used extensively in the arts and is, in fact, the chief agent for obtaining most of the other acids, by extraction from salt. In the chemical laboratory, the uses to which it is put are innumerable, and in the separation of copper, cobalt, nickel, silver and platinum from their ores, it is an important agent. Phosphorus, bromine, iodine, ether, starch, glucose, sugar, phosphorescent drinks, parchment paper, celluloid, nitroglycerine, gun cotton, coal tar colors and many dyes are all prepared by its aid. It is used in calico printing and in tanning, in dyeing, in refining tallow and many of the oils and in the preparation of all the sulphates. When to all these important uses we add its function as a medicinal agent, it is evident that sulphuric acid is really the most important of all the acids.

Manufacture. Sulphuric acid is manufactured on a large scale by burning sulphur or iron pyrites in a furnace and conducting the fumes with oxide of nitrogen into chambers lined with lead and containing steam. The sulphur dioxide formed by the burning sulphur takes an atom of oxygen from the nitric oxide and becomes sulphur trioxide. This unites with the steam and forms sulphuric acid, which gathers on the floor of the chamber.

Formerly sulphuric acid was made by distilling green vitriol, or sulphate of iron. From this process of manufacture it is sometimes called *oil of vitriol*.

SULTAN, an Arabic word meaning *mighty one*, or *lord*, is the ordinary title of Mohammedan rulers. The ruler of Turkey assumes the title of *sultan-es-selatin*, or sultan khan, "sultan of sultans." The title sultan is also applied to the sultan's daughters, and his mother, if living, is styled *Sultan Valide*.

SULU, *soo'loo*, **ISLANDS**, the southernmost group of the Philippines, comprising nearly 200 small islands, the total area of which is about 1,600 square miles. Politically they are a part of the Philippine province of Moro. The archipelago is divided into six groups. Named in their order from the northeast, these are Basilan, Samales, Sulu, or Jolo, Siarsi, Kinatussan and Tawi-Tawi. Sulu is the most important. Nearly all the islands are covered with forests, which contain considerable teak and sandalwood. The

chief cultivated crops are rice, cacao, maize and various sorts of roots. Cocoa, bananas, breadfruits, mangoes and oranges are native to the island. The natives are chiefly Moros.

SUMAC, *su'mak*, or **SUMACH**, a genus of shrubs and small trees, containing about one hundred species, widely distributed throughout the world, in temperate and tropical climates. The most general North American species is the *Virginian*, or *stag-horn, sumac*, distinguished by crooked, downy branches and small red berries. It turns flaming red in the autumn. The *smooth-leaved sumach*, which is also common in the United States,

has acid leaves and ornamental red berries.

Both these varieties produce valuable dye. Two closely-allied species, found in almost all parts of the United States, are poisonous. They are creeping



SMOOTH-LEAVED SUMACH

or climbing vines, bearing groups of three leaflets. Another poison variety, which grows in swamps, is a shrub from fifteen to twenty feet high, which bears clusters of greenish-white flowers. Its leaves are extremely poisonous to some persons, producing serious inflammation or eruption of the skin. A Japanese poisonous variety produces a sap from which a fine lacquer is made.

SUMATRA, *soo mah'tra*, a great island in the Indian Ocean, separated from the Malay Peninsula by the Strait of Malacca and from Java by the Strait of Sunda. The equator traverses it about midway. Its greatest length is about 1,050 miles, its breadth about 240 miles, and its entire area about 180,000 square miles. Banca and other islands are adjacent to the coast. The west side of the island is mountainous, with peaks ranging in height from 2,000 feet in the south to 5,000 feet farther north, and culminating in Indrapura, a volcano 12,400 feet in height. Gold, copper, tin and iron are

found in abundance, and deposits of coal occur in places. The chief rivers are the Rokan, the Musi, the Jambi and the Indragiri, all of which have extensive deltas. The climate is unhealthful; rain falls almost incessantly in the south.

Mangroves are the chief vegetable product of the coast; in the more elevated regions, are found myrtles, palms, figs and oaks. The camphor tree is indigenous to the north, while among the curiosities are the upas tree and the gigantic rafflesia. Pepper, rice, sugar, tobacco, indigo, cotton and coffee are cultivated for export; also, in smaller quantities, are benzoin, catechu, gutta-percha, caoutchou, teak, ebony and sandalwood. The animals include the elephant, tapir, two-horned rhinoceros, tiger, orang-utan, some species of deer and antelope and numerous birds and reptiles. The domestic animals are cows, pigs and horses.

The island is for the most part under the authority of the Dutch. There is a mixed population of Malays, Chinese, Arabs and native tribes, some of whom resemble the Caucasian types. The chief religion is Mohammedanism. See map, ASIA.

SUMMER, the season of the year between spring and autumn, beginning with the summer solstice, about June 21, and ending with the autumnal equinox, about September 22. In Canada and the United States June, July and August, the hottest months of the north temperate zone, are generally regarded as the summer season.

SUMMONS. See WRIT.

SUM'NER, CHARLES (1811-1874), an American statesman, born at Boston, Mass., and educated at Harvard University. In 1834 he was admitted to the bar, and in 1836 he published three volumes of Judge Story's decisions, subsequently known as *Sumner's Reports*, and he also edited a periodical called the *American Jurist*. The years between 1837



CHARLES SUMNER

and 1840 were spent in Europe, and the period following was occupied with legal practice in Boston. Sumner first gained note as

an orator in 1845 by a famous address, *The True Grandeur of Nations*. Five years later, as a supporter of the anti-slavery cause, he was elected to the Senate of the United States by a coalition of Free-Soilers and Democrats. He remained there until his death, an active and distinguished champion of freedom.

In May, 1856, his speech *The Crime Against Kansas*, which vigorously attacked slaveholders, brought a violent assault by Preston S. Brooks, a member representing a slaveholding state (South Carolina). The injuries inflicted compelled Sumner to absent himself from public duties for nearly four years and eventually caused his death.

Sumner supported Lincoln and Hamlin and advocated the view of reconstruction known as the theory of "state suicide" (see RECONSTRUCTION); he opposed President Johnson and the home and foreign policy of President Grant, and he supported Greeley in 1872.

SUMPTUARY LAWS, the general term applied to laws to repress extravagance. Such laws were common in ancient times, being directed especially, in both Greece and Rome, against extravagance in dress and in entertainments, the theory being that by regulating expenditures poverty and crime could be checked. Sumptuary laws were revived by Charlemagne, and in France various laws and decrees of a similar nature were passed, down to the reign of Louis XV. In England such laws were passed from the reign of Edward III to the time of the Reformation.

In the United States, the Federal and state constitutions forbid, generally, the passage of sumptuary laws. However, some of the laws passed for the protection of health and safety are sumptuary in character.

SUMTER, S. C., the county seat of Sumter County, forty-three miles southeast of Columbia, on the Atlantic Coast Line, the Carolina, Atlantic & Western and the Southern railroads. The city is in an agricultural region, and is known for its extensive trade in cotton. It contains more than fifty industrial establishments, including cotton mills, a cotton compress, cottonseed oil factories, planing mills and manufactures of telephones, golf sticks, coffins and caskets. The city has a Y. M. C. A. and several academies. The commission form of government was adopted in 1913. Population, 1910, 8,109; in 1917, 9,886 (Federal estimate).



SUN, the source of heat light and life, the controlling body in the solar system and the most conspicuous object in the sky, is only one of the thousands of stars—

Which stand as thick as dewdrops on the fields Of heaven.

Notwithstanding its importance to us it should be remembered that not only is the sun a star, but that it is by no means one of the largest. Arcturus, for instance, is possibly

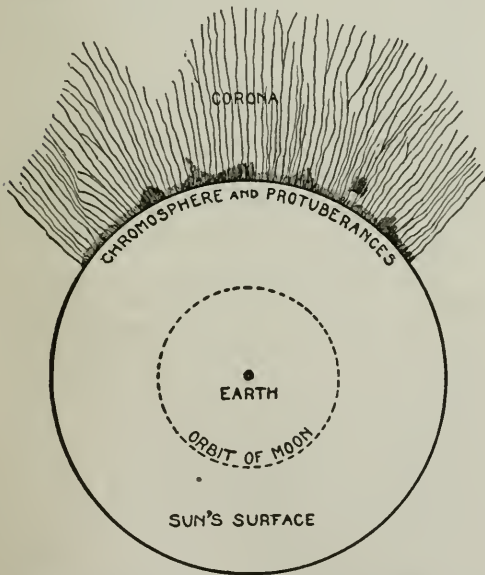
100 times the diameter of the sun and gives out 6,000 times more light. The North Star is probably 200 times as strong as the sun.

Size of the Sun. The sun is more than 865,000 miles in diameter, or 110 times the diameter of the earth, and in volume it is 1,300,000 times the size of the earth. Its density, however, is about $\frac{1}{4}$ that of the earth, and, accordingly, its weight is only 334,000 times as much. Its gravity is 27 times that of the earth, so that if it were possible for a man to get to the surface of the sun, he would weigh more than two tons and would probably be crushed by his own weight. The sun's distance from the earth is about 93,000,000 miles. It turns on its axis once in about 26 days, the equatorial regions rotating more rapidly than the regions farther away from the equator. This curious fact is thought to prove that the sun is a gaseous mass, but it is not thoroughly understood by astronomers.

Structure of the Sun. The vast unknown interior of the sun is, of course, wholly invisible to us, but astronomers can note the shining surface, which they call the *photosphere*; a cloak, or envelope, of burning hydrogen, called the *chromosphere*, which shows red through the spectroscope; irregular *prominences*, connected by the chromosphere and extending up through it, vast planes of hydrogen, thousands of miles high, beside which our earth is but a speck, and a still more vast luminous envelope, called the *corona*, seen in total eclipses, where it shows in hairy, radiating lines, long near the equator and shorter about the poles. The surface of the sun does not appear clear and equally brilliant in all parts, but is mottled with

small patches of greater light distributed in streaks and groups. The spots, which seem to consist of a dark center, surrounded by radiating lines, are irregular in shape and vary greatly in size, from 1,000 to 100,000 miles in diameter. They are not constant in shape, but often split into two parts. Though there are always some spots visible, yet there are periods, recurring at regular intervals, in which the spots are much more numerous. Sometimes a spot is visible for but a few hours, while again it may last for months. The spots probably are depressions in the surface, in which the cooler gases have collected. Two kinds of prominences are seen—the eruptive, like shooting flames, and the cloudlike, which seem to float above the surface. The composition of these prominences and of the corona was discovered by the use of the spectroscope during an eclipse; they are thought to be principally burning hydrogen, yet other gases are probably mingled with it.

From the diagram, the comparative size of the earth and the moon's orbit and the relative shapes and sizes of the visible parts of the sun may be seen. It should be understood that this diagram is a section only, and the



corona, chromosphere and protuberances extend in every direction from the center of the sphere. The discoveries made by the use of the spectroscope have been marvelous and have enabled astronomers to learn what materials enter into the composition of the sun.

It has been shown that these substances are the same as those which enter into the composition of the solid part of the earth. The sun is, then, probably composed of heated gases held together by gravity. It is not thought that the sun burns as we see a piece of wood burn, for there has been time since the earth was first inhabited for the sun to burn and cool off, if that were the case; but there has been no appreciable falling off in temperature. What keeps up the heat we do not know, though many theories have been advanced to account for it. The sun certainly gives off heat in enormous quantities, and it may be possible that millions of years hence it will begin to cool and in time lose all its heat. See ASTRONOMY; SOLAR SYSTEM; STARS.

SUNBURY, PA., the county seat of Northumberland County, fifty-four miles north of Harrisburg, on the Susquehanna River and on the Pennsylvania and the Philadelphia & Reading railroads. It is in a lumbering and coal-mining region and has railroad shops, silk, woolen, lumber and flour mills, coffin works, foundries and machine shops. The important structures are the Packer Hospital, the courthouse, the jail and parish houses. Sunbury was settled in 1772, on the site of Fort Augusta and of an old Indian village. It was incorporated in 1797. Population, 1910, 13,770; in 1917, 16,661 (Federal estimate).

SUNDA ISLANDS, two groups of islands south of the Malay Peninsula. The Greater Sunda group includes Sumatra, Borneo, Celebes, Java, Banca and Billiton; the Lesser Sunda Islands are Bali, Lombok, Sumbawa, Flores, Ombai, the Timor group and a number of others. With the exception of a part of Borneo, the islands of both groups belong to the Netherlands. Spices, copra, fruits, coffee, tobacco, sugar, rice and cocoa are exported.

SUN DANCE, a religious ceremony once common among most of the tribes of the Plains Indians of North America. Because of the torturous rites practiced in connection with it, the dance has been forbidden by the United States government. Formerly an entire tribe gathered annually for the ceremony; it was conducted within a circular space enclosed by the tepees of the families assembled, and lasted more than a week. To the sound of drum and singing the stripped and painted performers danced about a

sacred relic for several days without food and with sticks thrust like skewers through their flesh.

SUNDAY. See **SABBATH.**

SUNDAY, WILLIAM ASHLEY (1863-), an evangelistic preacher, popularly known as "Billy" Sunday. Born in Ames, Iowa, and made an orphan by the Civil War, he spent his early years in an Iowa soldiers' home. He was graduated from high school and attended Northwestern University. From 1883 to 1890 he was a professional baseball player, playing on teams of the National League. After his conversion he did Y. M. C. A. work in Chicago from 1891 to 1895, and in 1896 he began preaching, though he was not ordained a Presbyterian minister until 1903. His success has been phenomenal. He has been criticized for his spectacular behavior before his audiences and for his slang; but no one questions his sincerity. His appeal is wide, for his message is easy for the average man to understand—a word of cheer for the fallen, and a call to men and women to practice the simple virtues of honesty and duty to their fellows.

SUNDAY SCHOOLS, or BIBLE SCHOOLS. In 1918 there were in the United States 145,957 Sunday Schools, with an enrollment of 17,715,224 pupils and teachers, and in Canada there were 10,335 schools with an enrollment of 4,040,017. The statistics for the world compiled for the world's convention which met at Zurich, Switzerland, in 1913, showed 310,000 Sunday Schools, with a total enrollment for the world of 27,000,000 pupils, not including 2,850,000 pupils in the Roman Catholic Church.

To Robert Raikes, an Englishman, is due the credit of originating the modern Sunday School, about 1780. Before he died, in 1811, there were 400,000 children in the Sunday Schools of Great Britain alone. The system met with opposition, as it seemed, to some persons, to interfere with the duties of the home and the keeping of the Sabbath, yet in spite of a council of bishops, called to stop the movement, it spread over the world. In 1824 the American Sunday School Union was formed, and through its influence, within ninety years, 125,000 Sunday Schools had been organized and over \$15,000,000 had been expended in distributing Bibles and other religious works.

The first national convention of the Sunday School Union met in New York City in 1832.

In its meeting in 1872 the uniform lesson system was inaugurated. Dr. John H. Vincent, with Mr. Jacobs of Chicago, took the initiatory steps which led to the publication of the *International Series of Lessons*, which were used by most Protestant denominations in the world for more than a quarter of a century, when they began to be replaced by the graded courses which are now very generally used. In 1878 an international convention was organized, which meets once in two years.

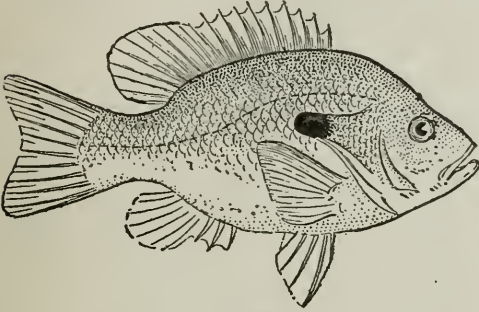
SUNDERLAND, ENGLAND, a seaport and one of the greatest coal-shipping stations in the world. It is situated in Durham County at the mouth of the Wear, 261 miles northwest of London. Sunderland is one of the most important shipbuilding centers in Great Britain. Its fine harbor is defended by many batteries. Among rich, deep coal mines of the vicinity is the deepest one in existence. There are also extensive shipbuilding works, fisheries, iron works and glass factories. Other industries include the manufacture of earthenware, machinery, chemicals, ropes and anchors and other iron ware. Population, 1914, 152,436.

SUNDEW, a group of plants so called because the leaves are covered with a sticky fluid which glistens like dew. When a small insect alights on this sticky substance it is held fast and when it dies the soft parts of its body are absorbed by the plant. An American species is the *round-leaved sundew*, the leaves of which are clustered in a rosette. The tall, slender flower stalks bear rows of small, white blossoms. See **VENUS'S FLYTRAP; PITCHER PLANT.**

SUN DIAL, an ancient device for measuring time. The dial consists of two parts, the *face*, or *plane*, and the *back*, or *gnomon*. The face, a plate, usually of metal, which is intended to lie horizontally on a standard, is divided into four quarters, each of the four dividing lines pointing to one of the major points of the compass. The gnomon is usually a triangular plate of metal, placed vertically on the plane in a position parallel to the earth's axis and with one of its angles at the center of the plane. At noon the shadow of the gnomon reaches the line on the face pointing north; at six o'clock in the morning it reaches the line indicating west, and at six o'clock in the evening, the line indicating east. Thus, as the shadow travels around the plate, the hour is shown by its position with refer-

ence to the points of the compass indicated. The sun dial is the oldest known device for measuring time.

SUNFISH, a name applied to several groups of widely varying fishes, both marine and fresh-water. The North American fresh-



SUNFISH

water sunfish, never more than ten inches long, is brightly colored. The common sunfish, which is orange-colored and about seven inches long, is abundant in streams and ponds from Maine to Florida. It delights the amateur angler by its energetic manner of biting. The ocean sunfish, which attains a length of several feet, is of grotesque appearance. This variety is unfit for the table.

SUNFLOWER, a genus of plants of the helianthus family, so called because the blossoms with their large seed disks and long radiating yellow petals bore an ideal resemblance to the sun with its golden rays. These flowers, sometimes a foot in diameter, are borne at the top of tall stout stalks, from six to fifteen feet high, which are nearly hidden by large, heart-shaped leaves. The plants are easily grown from seeds, though the roots are perennial. The species are numerous, but almost all are found in North America. The gigantic sunflower common in gardens is a native of Peru. The seeds form an excellent food for poultry and for cage birds; and an edible oil has also been expressed from them.

SUNSTROKE, a term applied to two different ailments resulting from the overheating of the body; *heat stroke*, or *heat fever*, and *heat exhaustion*, or *heat prostration*.

Heat prostration is characterized by great exhaustion, weakness, faintness and even nausea, followed or accompanied by a remarkable fall in temperature. In these cases the temperature of the body should be raised by external applications of heat and by internal stimulants.

Heat stroke, or *sunstroke*, comes on more suddenly than does heat exhaustion. The patient usually loses consciousness and the temperature rises rapidly, often reaching 115° F. The body is flushed and burning hot. In this case, the temperature of the body should be lowered as rapidly as possible, by sprinkling ice water over the chest and body and by rubbing the limbs with ice or ice water. The patient should then be placed upon a bed and wrapped in warm blankets. If the temperature again rises, the same process should be continued, until the body reaches its normal condition.

If during the heated term more care is taken in eating and drinking many fatalities will be prevented. Excesses of all kinds should be avoided, especially indulgence in alcoholic liquors.

SUPERIOR, *soo pe' ri or*, LAKE, the largest expanse of fresh water in the world, and the most westerly and most elevated of the Great Lakes of North America. It washes the shores of the state of Minnesota on the west, those of Wisconsin and the northern peninsula of Michigan on the south, and those of Canada on the north and east. Its greatest length is 420 miles, its greatest breadth, 167 miles, and its area, 31,200 square miles. It is 602 feet above sea level, and has a maximum depth of 1,008 feet. In shape it forms an irregular crescent, dotted with numerous islands toward its northern and southern sides. The northern shore consists of cliffs, varying in height from 300 to 1,000 feet, but the southern shore is low and sandy, although occasionally interrupted by cliffs, among which are the fantastic Pictured Rocks, 300 feet high, one of the greatest natural curiosities of the United States. The waters of the lake are remarkable for their transparency and are well stocked with fish, principally trout, whitefish and sturgeon. The region surrounding the lake is rich in minerals, copper and iron being found in abundance.

Lake Superior discharges into Lake Huron by way of Saint Mary's River, an outlet at the southeast. A drop of about twenty feet from the larger to the smaller lake and a series of rapids at the head of the river have made necessary the construction of the Sault Ste. Marie Canal, consisting of a series of locks, four on the American side. Were it not for this canal system, navigation from Lake Superior into the lower lakes would be

impossible. The chief cities on the lake are Duluth, Minn.; Superior, Wis.; Marquette, Mich.; Ashland, Wis.; and the Canadian cities of Port Arthur and Port William. See GREAT LAKES; SAULT STE. MARIE CANAL.

SUPERIOR, WIS., third city in size in the state, the county seat of Douglas County, on Lake Superior and the Saint Louis River, opposite Duluth, Minn., and on the Northern Pacific, the Great Northern, the Chicago and North Western, the Duluth, South Shore & Atlantic, the Chicago, Milwaukee & Saint Paul and the Minneapolis, Saint Paul & Sault Ste. Marie railroads. Together with Duluth, Superior has one of the finest harbors in the world, with a water frontage of more than thirty miles. Immense shipments of grain, coal, iron and copper ore make it one of the foremost ports for tonnage in the world. One of its grain elevators has a capacity of 6,500,000 bushels. Industrial establishments include flour and lumber mills, shipyards, packing houses and manufactories of wagons, furniture and various iron and steel products. The city is connected with Duluth by two railroad bridges and a ferry. It has two public libraries, a state normal school, a business college, two high schools, a Federal building, a Carnegie Library and three hospitals. In the latter part of the seventeenth century the great explorer, Du L'Hut established a trading post here. The town was first laid out in 1853, by a corporation whose leading members were W. W. Corcoran, Stephen A. Douglas, John C. Breckenridge and other distinguished Southerners. It was incorporated as a city in 1889. A commission form of government is now in operation. Population, 1910, 40,384; in 1917, 47,167 (Federal estimate).

SUPERNATURALISM, *su pur nat'u ral iz'm*, a belief in the supernatural; that is, in supernatural, or, more properly, supernormal phenomena, and in divine revelation through it. The doctrine of supernaturalism has been opposed by naturalists and by some scientists, who maintain that miracles are contrary to natural law and therefore impossible. Both the Old and the New Testament are full of supernaturalism, and the Christian religion is one of those which supports belief in divine revelation through supernormal means.

SUPERSTITION, *su per stish'un*, literally *that which stands over one*. It is a belief that is based on an irrational foundation, with

a mental background of fear or dread, in most cases. Belief in the effect of the moon on the weather, ascribing ill luck to the number thirteen, considering Friday an unlucky day, and belief that the horseshoe and the rabbit-foot bring good luck, are common superstitions of the harmless variety. In rural communities there are people who believe that seed must be planted when the moon is on the increase because the increase of the moon will cause the crops to increase. On the other hand, the same people believe that weeds and other obnoxious plants should be destroyed when the moon is on the wane because its decrease will insure their complete destruction. These beliefs, which some people take seriously and others deride, are among the most common superstitions.

But there are other superstitions of a more serious nature. These are usually associated with religion, and those who hold them are very tenacious of their beliefs. Among superstitions of this sort are belief in dreams, belief in the influence of the heavenly bodies over one's destiny, belief in the influence of the gods, in horoscopes, witches, and the pursuing vengeance of the laws of nature. Such beliefs are usually founded upon fear. Their influence over the individual is such as to affect his mental attitude towards everything that confronts him, and a person so affected usually lives in constant dread.

What constitutes a superstition in the mind of one is a reality in the mind of another; therefore it is impossible to make a clean-cut division between beliefs that are superstitions and those that are not. Formation of the habit of logical scientific thinking is the best means of ridding the mind of superstitions. Moreover, by frequently entertaining certain superstitions as jests, some people come to look upon them as realities. While such people usually become indignant if accused of being superstitious, they look hopefully upon the horseshoe over the door and carefully treasure the left hind foot of a rabbit.

Related Articles. Consult the following titles for additional information:

Alchemy	Magic	Physiognomy
Astrology	Muscle	Spiritualism
Clairvoyance	Reading	Telepathy
Divination	Necromancy	Theosophy
Faith Cure	Palmistry	Trance
Hypnotism	Phrenology	Witchcraft

SUPERVISOR, an elected local officer. In New York, Michigan, and several other states the supervisor is the chief administrative official of a town. The chief county

authority is vested in the board of supervisors, made up of all the supervisors in the county. This type of government has also been adopted, sometimes with modifications, in Wisconsin and other states of the Middle West. In Michigan and Illinois there is a single supervisor for each township; in Minnesota and Wisconsin each township has three supervisors. In Michigan the supervisor is also a tax assessor, and in Illinois he acts as treasurer. In the Southern states, where the county is the unit of local government, the chief authority of the county is wielded by a board of supervisors, each member representing a district.

SUPPLY AND DEMAND. In economics, value is generally considered to be the power given by an article to its possessor to command in exchange for it the labor or the product of the labor of others; one of the chief agencies in determining this value is the law of supply and demand. By this is meant the relation which the quantity of a commodity on hand, with the prospects for its continued production, sustains to the quantity being consumed, with the prospect of continuous consumption. For example, before the outbreak of the World War, woollens and dye-stuffs were manufactured in Europe in large quantities and were imported into the United States in such quantities as to meet the demands of the trade. The prices in these articles varied but little from year to year. So long as these conditions remained uniform the supply and demand were equal and the market was stable. However, with the outbreak of the war the importation of these articles was greatly restricted, and soon ceased altogether. Within a few months the demand for these commodities far exceeded the supply, and their value rapidly increased.

On the other hand, let the demand for a commodity decrease or let some event occur that points clearly to discontinuing the use of the commodity in the near future, and its value will suddenly decrease. New inventions, for instance, render old machines useless, and new discoveries set aside old processes, and in the changes thus brought about, the values of commodities connected with the old methods are changed.

Evidently there can be no absolute standard of value, as there can be no absolute measure of desire or of difficulty; but to avoid rapid and violent fluctuation, values are measured by reference to some one article, that is, an

article is said to be more or less valuable than a given article, according as its possessor would be willing to give more or less of it in exchange for the given article. Usually this article, or medium of measurement of value, is a precious metal and is called *money*. The expression of the value of an article in money is generally called its price. See **ECONOMICS**; **MONEY**.

SUPREMACY, *su prem'asi*, **ROYAL**, a term which is applied to the authority of the English sovereign over the Established Church of England. Up to the time of the Reformation the Pope had been head of ecclesiastical affairs in England, but in 1534, after the Pope had refused to annul the marriage of Henry VIII and Catharine of Aragon, Henry persuaded Parliament to proclaim him head of the Church. Although during the reign of Mary the Papal authority was again acknowledged, Elizabeth for the second time abolished it, and a new act of supremacy was passed.

SUPREME COURT OF CANADA. The Supreme Court is composed of a chief justice and five puisne (or associate) judges. It is the highest court of appeal and has appellate, civil and criminal jurisdiction throughout the Dominion of Canada. The judges reside at Ottawa, where the Supreme Court holds three sessions each year—the first beginning on the third Tuesday in February, the second on the first Tuesday in May, and the third on the first Tuesday in October. In unusual cases, where the question at issue is of exceedingly great importance, appeal may be allowed from the decision of the Dominion Supreme Court to the Privy Council in England, but the court is intended to be, as far as possible, the court for the final settlement of controversies arising from the operation of the constitutional system of the country. By an act passed in 1891, the Governor-General has authority to refer to the Supreme Court important questions relating to provincial legislation, education or any problems of general public interest.

SUPREME COURT OF THE UNITED STATES, the highest judicial body in the nation and the head of the judicial department, one of the three departments of the government provided by the Constitution (see page 932), the others being the legislative and the executive.

The legislative department enacts the laws, the executive branch puts them into effect

and enforces them, and the Supreme Court interprets them. This means that if there is a possibility that a law has been passed which violates a constitutional provision, the Supreme Court will determine the constitutionality of that law; if it is deemed a violation, in letter or in spirit, the few men who comprise this court will undo the word of over 500 legislators and declare the law null and void. Such vast responsibility can safely be entrusted only to the wisest legal minds; therefore to this learned group only the most profound constitutional lawyers are supposed to be appointed, which fact has given the Supreme Court the reputation of being the most exalted judicial body in the world.

The Supreme Court is at the head of the entire Federal judicial system for the trial of offenses committed against the United States. This single court could not hope to dispose of all the work which such an obligation would impose on it in a rapidly-growing nation; the Constitution therefore provided that inferior courts should be organized to relieve the higher court of the greater part of such detail. These inferior courts are now ninety-three in number, and are called United States District courts. They are located in every state in the Union and in all outlying possessions. Appeals from their decisions reach, first, courts of appeals, presided over by District Court judges, and some may reach the Supreme Court for determination.

Powers of the Supreme Court. The classes of cases falling under the jurisdiction of this court, in addition to determining the constitutionality of laws, are named in the Constitution. In the following paragraphs the words in heavy-face type are quoted from the Constitution; that which follows is explanatory:

All cases affecting ambassadors, public ministers and consuls. These are officials of the general government whose relations are entirely with foreign governments. Therefore the national government instead of a court of the state in which the litigant may reside should have original jurisdiction.

All cases of admiralty and maritime jurisdiction. The high seas belong to all nations and an offense committed thereon naturally should be tried by a court representative of the nation involved.

All controversies to which the United States shall be a party. In cases of this nature the entire citizenship of a country is interested and a national tribunal rather than a state court must decide the issues involved.

All controversies between two or more states. To permit a court in one of the contending states to settle such a controversy would be prejudicial to fair judgment. An outside tribunal is necessary to which all parties may appeal.

All controversies between a state and citizens of another state and to controversies between the citizens of the same state claiming lands under grants of different states, the same reasons apply as in the case last mentioned.

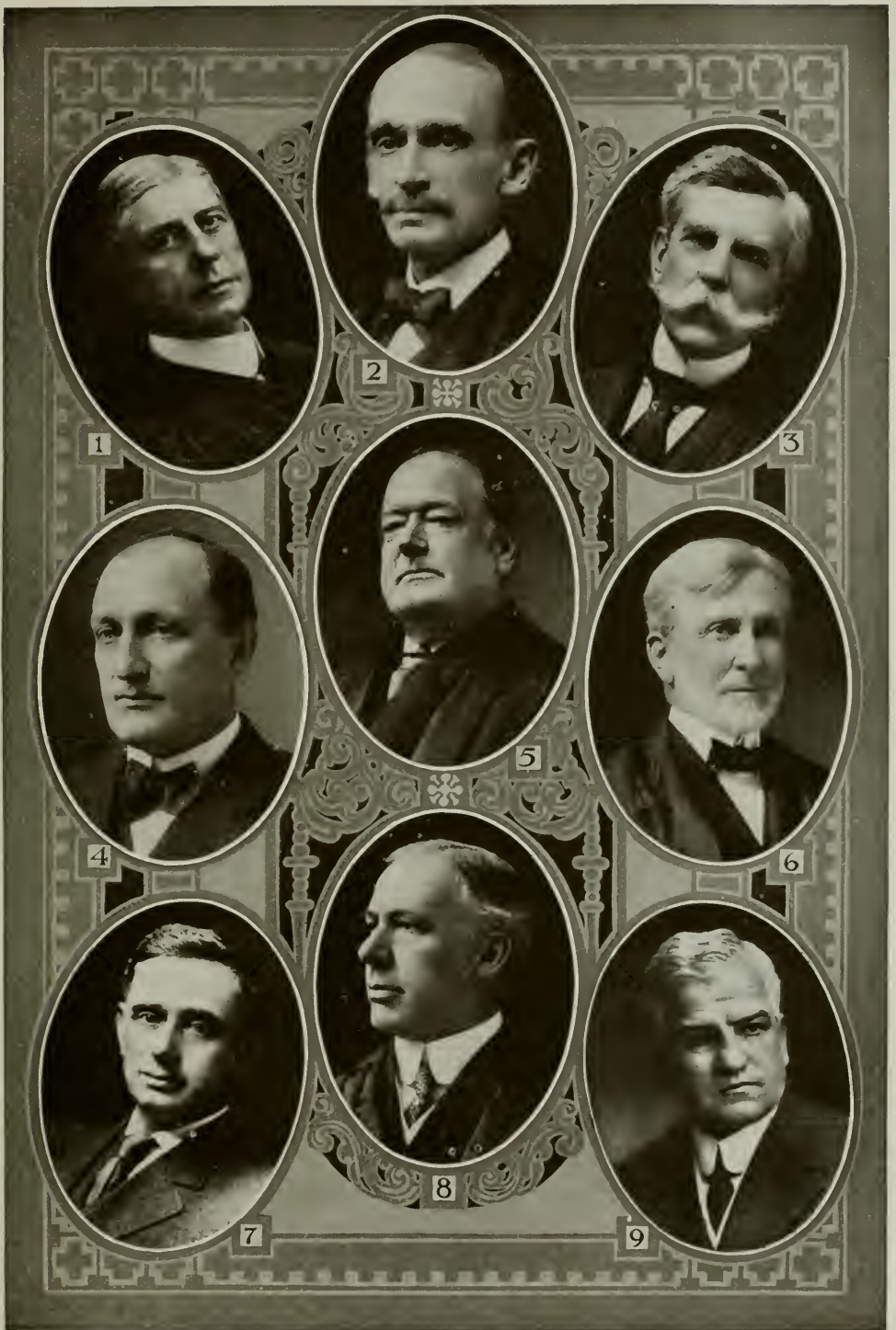
All controversies between a state or the citizens thereof and foreign states, citizens or subjects. If citizens of any state offend a foreign state or its citizens or subjects, the peace and honor of an entire nation are involved rather than the safety of a single state.

Members of the Court. The President of the United States appoints the members of the Supreme Court, with the approval by majority vote, of the Senate. The head of the Court is termed the Chief Justice; the other members are Associate Justices (the term *judges*, often employed, is incorrect). The court has increased in personnel from six members, in 1789, to nine. Members are appointed for life, but they may be removed by impeachment for improper behavior. The salary of the Associate Justice is \$14,500; of the Chief Justice, \$15,000. Any member upon reaching the age of seventy may retire and receive \$14,500 yearly for the remainder of his life, provided he has served ten years.

There have been nine Chief Justices, as follows: John Jay, John Rutledge, Oliver Ellsworth, John Marshall, Roger B. Taney, Salmon P. Chase, Morrison R. Waite, Melville W. Fuller and Edward D. White.

SURABAYA, or SOERABAYA, *soo ra bah'ya*, a seaport of Java, situated on the north coast, opposite the island of Madura and at the mouth of the Surabaya River. The chief buildings are the government house, the mint and storehouses. It has a large and safe harbor, which is defended by strong fortifications. Shipbuilding docks and a naval station are located here. The trade is large, and, next to Batavia, it is the most important commercial center of the Dutch East Indies. Population, 1915, 156,752; of this number 15,000 were Europeans, 20,000 were Chinese and 2,660 were Arabs.

SURGERY, that branch of the healing art which comprises operative measures for the curing of disease. Modern surgery has been developed since the middle of the nineteenth century, or since the discovery of



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SUPREME COURT

1. Mahlon Pitney
4. James C. McReynolds
7. Louis D. Brandeis

2. William R. Day
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8. Willis Van Devanter

3. Oliver W. Holmes
6. Joseph McKenna
9. John H. Clarke

anesthesia. Before the use of ether and chloroform only those operations were performed that were absolutely necessary, in case of accident or to save the patient's life, because the patient could not withstand the pain. The discoveries of Pasteur in bacteriology, the application of these discoveries to surgery and the formulation of the theory of antiseptics by Sir Joseph Lister removed in a great measure the danger of blood poisoning that was the dread of the surgeon as well as the patient. Before Lister's discoveries, fever, abscesses, blood poisoning, gangrene and other diseases were some of the after-effects of all surgical operations. To-day these after-effects have been prevented, and the field of surgery has been broadened until it extends to every organ and tissue in the human body, "from the crown of the head to the tip of the toe."

What Surgery Does. The chief purposes of surgery are to repair injuries caused by accident; to cure disease by removal of affected minor organs or unnatural growths, such as tumor and cancer; to remedy physical defects caused by disease or deformity; to relieve suffering in cases where cure cannot be effected, and in some cases to aid the physician in diagnosis.

Some of the operations and their results are among the greatest triumphs of modern science. Remarkable cures in cases of abdominal diseases have been effected by removing a part or the whole of the diseased organ—as a kidney, the gall bladder or a portion of the intestine. Brain specialists are able to locate tumors, blood clots and other disorders which prevent that organ from discharging some of its functions, and these obstructions are successfully removed. Certain forms of epilepsy caused by disease of the brain have also been cured by operation. The transfusion of blood from the system of a healthy person to that of one who has lost a large quantity of blood by accident, or who is anemic, and skin grafting for the purpose of removing scars, or for the relief of one who has lost skin by a burn, are well-known operations. Crooked limbs are straightened, and healthy organs are transplanted to take the place of diseased parts.

Methods. In operations requiring the use of ether or chloroform, preparation of the patient begins about twenty-four hours before the time set for the operation. The alimentary tract is thoroughly cleansed and

the body bathed with soap and water; then the part to be operated on is washed with a strong antiseptic. Just before the operation this part is again washed with soap and water, followed by the antiseptic. The part is then covered with a sterilized towel until the surgeon is ready to operate. The operating room and everything in it, as well as every one who is to come in contact with the patient, are disinfected. In some cases surgeons and nurses wear antiseptic masks, and most surgeons use rubber gloves that are thoroughly disinfected after each operation. Every precaution is taken to assure the patient a speedy recovery; yet, in major operations, fatalities occur, because the shock to the nervous system is so severe that the patient is unable to overcome it.

History. While modern surgery is of recent development, surgery has been practiced from the earliest times. Herodotus says that the medical art in Egypt was divided into numerous branches, representing each member of the body. The Greeks knew and practiced several important operations, in a mode little behind modern practice. The Romans followed the Greeks and improved upon their methods, besides inventing new operations of considerable difficulty. On the decline of the Roman Empire, the medical art in Europe fell entirely into the hands of the monks, and when, in 1163, the Council of Tours prohibited the clergy from performing any operations, surgery became incorporated with the trade of barber and was reduced to the simplest operations, chiefly that of letting blood. The earliest revival of the science arose from the contact of Europeans with the Eastern nations, particularly the Arabs, and before the close of the eleventh century, Salerno, in Italy, acquired celebrity for a school of medicine. From that time on there was a continual growth in surgical skill and knowledge.

Related Articles. Consult the following titles for additional information:

Amputation	Lithotomy
Anesthetic	Medicine
Antiseptic	Tourniquet
Bacteria and Bacteriology	Transfusion of Blood
Bandage	Trephining

SURROGATE, a judicial officer who has jurisdiction over the probate of wills, the administration and settlement of decedents' estates. In some states he is empowered to appoint and supervise guardians of infants and other legally incompetent individuals.

In American Law. In some states this official is called surrogate, in others, judge of probate, register, judge of the orphans' court, etc. He is ordinarily a county officer, with local jurisdiction limited to his county.

In English Law. In Great Britain this official is a deputy or substitute of the chancellor, bishop, ecclesiastical or admiralty judge, appointed by him to act in his place, as in granting licenses, in probating wills and granting administration of estates and guardianship. See COURTS; PROBATE COURT.

SURVEYING, *sur v'ing*, the art of running lines for the purpose of locating boundaries, measuring land and for determining the shape and area of any portion of the earth's surface.

Land surveying, which is confined to small areas, such as that used in measuring land and fixing the sites of buildings and other structures, does not take into consideration the curvature of the earth. *Topographical surveying*, which is on a much more extended scale, is for the purpose of producing maps that will show elevations and depressions of land, the location of bodies of water and other objects. *Railroad surveying* is for locating and determining the course and grades of lines of railway. The purpose of *marine surveying* is to locate shoals and other objects dangerous to navigation, the mapping of the mouths of rivers and entrances to harbors and the determining of depths of water in the courses over which vessels usually pass. Surveying on a large scale is usually under the direction of the national government. It requires a thorough knowledge of mathematics, and the operation of delicate instruments demands a high degree of accuracy.

SURVEY OF PUBLIC LANDS. See LANDS, PUBLIC.

SUSA, *soo'sa*, one of the dead cities of Persia, once the capital of the Persian province of Susiana, or Elam. It occupied a hilly site on a plateau which is to-day known as the province of Khuzistan. The whole section is fruitful and well watered, and excavations show that the city was the site of human habitation even in the Stone Age. After long occupation by Babylonia, Susa first came under Persian rule in the time of Cyrus, and under his successors it became a magnificent city, the chief metropolis of the Persian Empire. When Babylon rose to importance under Alexander, Susa declined. It was still inhabited as late as the Middle

Ages, but is now deserted. It is marked by mounds and a few ruins and a Mohammedan mausoleum known as the Tomb of Daniel.

SUSQUEHANNA RIVER, a river of Pennsylvania, formed by the union of a north and an east branch, which issue respectively from lakes Schuyler and Otsego, in Otsego County, New York. The general course of the Susquehanna is southwest, until it reaches the boundary line of Pennsylvania. From there it crosses the state in an irregular course from north to south. After flowing a short distance through Maryland it enters the head of Chesapeake Bay. The stream cuts its way through numerous ranges of mountains, forming gaps or passes, and along its course are many places of scenic interest. The most important tributaries are the Chemung, the Lackawanna, the West Branch and the Juniata. There are many important towns along its banks, including Binghamton and Owego, in New York, and Wilkesbarre and Harrisburg, in Pennsylvania. The entire length of the stream and its branches is about 500 miles. Because of the many rapids and shallows it is not navigable.

SUTLEJ, a river of India, the most easterly and the largest of the five rivers of the Punjab. Its source is near the sources of the Indus, the Ganges and the Brahmaputra. In the upper part of its course it flows westward through the Himalaya region; then it sweeps along the western foot of the Siwalik Hills, whence it has a generally southwest course until it unites with the Chenab, to form the Panjnad, or Five Rivers. After a course of about fifty miles it joins the Indus. The entire length of the stream is about 1,000 miles. In the upper part of its course it is a mountain torrent, but at Felor it widens into a shallow lake. Up to this point it is navigable for river craft. In the lower part of its course the waters are used for irrigation.

SUTTEE', the practice among the Hindus of burning a widow on the funeral pyre of her deceased husband. It was once general in India (at one time compulsory), but was abolished by the British in 1829.

SWALLOW, *swol'lo*, the general name of a family of birds somewhat resembling the swifts, found in all parts of the world except the coldest regions. They have weak feet and legs, but long and strong wings and remarkable powers of flight. The tail is a

little longer than the rest of the body and usually forked. The birds are exceedingly graceful on the wing, wheeling, dipping, soaring rapidly, skimming along near the surface of water and even drinking in flight. Some swallows are migratory, going near the polar regions in summer. They travel in large numbers, resting at night in woods and marshes. Some build in trees; others build stucco nests on the under side of bridges, in barn rafters and such places. The eggs, four or five in number, are white, sometimes spotted with brown. The North American *barn swallow* is perhaps



BARN SWALLOW

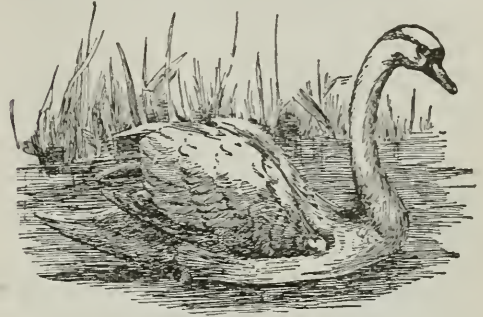
the swiftest of all flyers. The plumage is blue-gray above and chestnut-colored beneath, and the tail is deeply forked. The *tree swallow*, *cliff swallow* and the *purple martin* are familiar residents of the United States and Canada.

SWALLOWING, a muscular act, beginning in the mouth. The tongue is raised against the front part of the hard palate, the uvula takes a horizontal position to close the opening into the nostrils, the epiglottis is pressed down upon the glottis, or opening into the larynx, and when the food reaches the back of the throat it is seized by the involuntary muscles, carried quickly through the pharynx, slowly through the esophagus to the cardiac orifice, which opens to allow the food to enter the stomach. A juggler can drink while standing on his head, because swallowing is a muscular act.

SWAMP. See MARSH.

SWAN, *swan*, the largest bird of the duck family, famous for its grace and beauty on the water. Among the Greeks and Romans the swan was venerated as the sacred bird of Apollo and the Muses. It was once thought that the swan sang beautifully just before its death; but as a matter of fact, all swans have harsh and rather unpleasant notes. They are strong, fierce fighters, defending their nests against preying animals and even against man. In North America there are two wild species, the *whistling swan*, which

has an orange spot between the eyes and the *trumpeter swan*, both of them white, with black bills and legs. The latter, which was



SWAN

at one time quite common in the Western United States, furnishes most of the swan's down for the market. Domestic swans are kept only for their beauty. The *black swan* is a native of Australia.

SWEAT. See PERSPIRATION.

SWEATSHOP SYSTEM, an industrial procedure whereby subcontractors undertake work in their own houses or small workshops, employing others to do it, and profiting by the difference between the contract prices and the wages they pay their assistants. As it is the object of the subcontractor, or sweater, to secure as large a margin of profit as possible, the tendency of the system is to reduce the wages of the worker to the lowest possible limit, on what is known as the piece-work basis. The evils of the sweatshop are long hours; an impossible wage scale; overcrowding of shops and tenement houses; unsanitary and unfavorable conditions of work; child labor, often causing disease and deformity due to confinement, filth and improper lighting; and the irregularity of the work.

Much of this sort of sweating has been done in industrial history, but its many evils have been mitigated with the advance of corporations, trades unions, factory inspection and legislation. The system appears in the United States among cigar makers, cloak makers and shop tailors, and it has given rise to strikes, out of which has come temporary relief.

Some states have legislated against the use of dwelling tenements for workshops, the overcrowding of workrooms and the employment of children. Massachusetts, New York, Ohio and Illinois have laws which provide

that all rooms for this work be licensed and regularly inspected. Manufacturers, too, are seeking to alleviate the evil and providing more healthful working conditions and better wages. See **FACTORY AND FACTORY LEGISLATION**.



Peasant Girl

SWEDEN, a kingdom of northern Europe, occupying the eastern and greater portion of the Scandinavian Peninsula. Russia, the Baltic Sea and the Cattegat and Skagerrak border it on the east, south and southwest, and Norway forms the western and northern boundary. Its greatest length is 940 miles; its greatest breadth is 225 miles, and its area is 172,035 square miles, making it about the size of Montana and Maine combined. The coast line exceeds 1,400 miles in extent.

The People. The Swedes are descendants of the Scandinavian branch of the Teutonic peoples who formerly inhabited the northern part of Europe. They are usually tall and well proportioned and have a light complexion, blonde hair and blue eyes. They are characterized by their industry, sobriety, cheerful disposition and general intelligence. They stand among the foremost of the world's progressive peoples. Wherever they have gone they have won a reputation for honesty and thrift.

The language is somewhat different from that of Norway and Denmark. Because of the union of that branch of the Scandinavians forming the Swedes with the Svears of the north and the Gotars of the South, the blending of the native language of these people with the old Scandinavian tongue produced a language somewhat more sonorous than the dialects found in Denmark and Norway, which very closely resemble each other.

The Lutheran Church is the established Church, and nearly all the inhabitants are followers of this creed. Other religions, however, are tolerated, and there are a few communicants of the various evangelical denominations, as well as some Roman Catholics.

In 1910 the population was 5,522,405; in 1916, estimated at 5,757,566.

Surface and Drainage. The Scandinavian Alps, or Kiolen Mountains, form the northern portion of the boundary between Sweden and Norway. These are low mountains consisting in some places of scarcely more than a high plateau. The highest summits are Sarjektjakkö, 6,855 feet, and Kaskasatjakkö, 6,809 feet. From the mountain barrier the land slopes by successive terraces toward the east and southeast. The coast is low, level and in some places marshy. It is estimated that nearly one-third of the surface of the country is below a level of thirty feet, while only a small portion of it has a level of 2,000 feet and over. The southern part of the country is generally low.

Sweden has a large number of rivers, and with scarcely an exception these flow in a southeasterly direction. The Tornöa and its northern tributary, the Muonio, form the boundary with Russia. Other important streams in their order, passing southward, are the Lulea, the Skelleftea, the Unea, the Indals and the Dal, flowing into the Gulf of Bothnia; the Klar, rising in Norway and flowing southerly into Lake Venner, and the Gota, discharging the waters of this lake into the Cattegat. The country has a large number of lakes. The most important of these are lakes Venner and Wetter. The former, having an area of over 2,100 square miles, is the third largest lake in Europe. The northern part of the country is studded with lakes, which in form are generally long and narrow. These, as well as most of the streams, are too small to be available for navigation, except near their mouths.

Climate. Considering its latitude, Sweden has a mild climate, though there is a marked difference in the mean annual temperature in its northern and southern extremities, the mean temperature at Stockholm for January being $24\frac{1}{2}^{\circ}$, and for July, 63° . In general the summers are hot, and the winters extremely cold; in the northern part of the country the thermometer sometimes falls as far as 40° below zero. There is scarcely any transition between winter and summer or between summer and winter. Spring and autumn, which characterize most temperate countries, here are very short or are lacking altogether. The rainfall averages about 20 inches for the entire country, but it is much heavier in the south, where it is about 35 inches, than in the north, where it seldom exceeds 13 inches. The greatest amount of rain falls during August.

Mineral Resources. Sweden has rich stores of minerals, and mining is one of the most important industries. Iron ore of excellent quality is distributed over the country, but the mines in the north are the most important. The central part of the country has been noted since earliest times in Swedish history for its production of iron and steel. About 7,500,000 tons of iron ore are mined annually, and about 6,500,000 tons are exported. Copper is extensively mined, and gold, silver, manganese and cobalt are found.

Forests and Lumber. At least one-half of the country is timberland. Dense growths of pine, spruce, birch and mountain ash are found on the uplands. Groves of oak border the lakes in the lowlands, and forests of birch are found in the fertile lowlands of the south. Most of the forests are on Crown lands and are controlled by the government. The largest lumber mills are located on the Gulf of Bothnia, and lumbering and other woodworking industries are of great value. They furnish employment for about 42,000 people.

Agriculture. Only a small portion of the land is suitable for cultivation. A large part of the remainder is covered with forests, and some of the rest is suited to grazing. Agriculture gives employment to about one-half of the inhabitants. The farms are generally small, ranging from five to forty-five acres in extent. The best lands are in the southern and central parts of the country, and here the farms, when well tilled, produce as much per acre as the best farms in England. The chief crops are oats, rye, potatoes, barley, wheat and hay and forage crops.

In the parts of the country where pasturage is good, the raising of live stock is important; here dairying receives the attention of a large number of farmers, and considerable quantities of butter are exported to Great Britain. Sugar beets are cultivated in the south, and flax, tobacco and hops are raised successfully in various localities. Agriculture is aided by the government, which establishes agricultural schools and sends teachers of agriculture throughout the country. Primitive methods are found only in remote localities.

Other Industries. Fishing has always been a profitable industry. Herring are taken in large quantities, and salmon abound in the mouths of the northern rivers, where extensive fisheries are established. Salted

and canned fish are among the leading articles of export. Of the manufacturing industries, those connected with the cutting and preparation of lumber and its products are by far the most important. Other important industries include the manufacture of flour, of textiles and foundry and machine shop products. Sweden is noted for its manufacture of iron, which is exported to nearly all countries of the world. Cream separators, lighthouse apparatus, telephone supplies, motors and electrical machinery are manufactured in various cities and towns. There are porcelain factories at Rostrand and Gustavsberg, and glass factories at Kosta and Rejmyre whose wares have a high reputation in foreign markets. The leading industrial centers are Stockholm, Göteborg and Norrköping, all of which have large textile establishments. The most important iron works are at Eskilstuna and Motala.

Transportation and Commerce. Transportation facilities are good. The roads are in excellent condition, and the country has over 9,300 miles of railway lines, which connect all of its leading commercial centers and join them with the important seaports of Norway. Canals connect many of the lakes and rivers, so that there are over 2,500 miles of inland waterways. All of these means of transportation give the country adequate facilities for moving its products. Telegraph lines extend throughout the country, and in 1916 there were over 373,000 miles of telephone wires, two-thirds of which were owned by the state.

The commerce is large, considering the size and population of the country. Most of it is maritime, and Swedish ships carry not only the trade of the country, but a considerable part of that of other nations. The leading exports are minerals, metal goods and machinery, live stock, hair, hides and other animal products, lumber and its products, which far exceeds the others. The imports consist of minerals, principally coal, metal goods, machinery, textiles, grain, flour and other food products. The foreign trade is carried on chiefly with Great Britain, Germany, the United States, Russia, France and Denmark.

Education. An excellent system of public schools is maintained, under the direct supervision of the government. Attendance is compulsory, and there is scarcely a person of school age who cannot read and write. In addition to the common schools, two univer-

sities are maintained, one at Upsala and the other at Lund. There are also fifteen normal schools and a number of technical schools, including schools of navigation, textiles, mining, medicine, veterinary science, agriculture and forestry. The deaf and blind are cared for in special institutions maintained by the state.

Literature. The earliest writings in Swedish literature which have been preserved are ancient provincial laws, some of which date from the thirteenth century. There are, too, ballads which were written at a very early date. Like the other countries of Europe, Sweden was affected in the later Middle Ages by the romantic movement in literature, and tales of chivalry were the result. In the sixteenth century little was produced except religious works, but in the century that followed Swedish writers began to be influenced by the writers of other countries, and a more varied literature resulted. The middle eighteenth century produced Swedenborg and Linnaeus, who were, however, of more importance to religion and science than to pure literature. Gustavus III was a patron of letters, and many writers of note were members of the court he assembled. The romantic movement which swept over Europe in the early nineteenth century affected Sweden with the other countries, and the first half of that century was the most noteworthy period in the history of Swedish literature. Tegnér (1782-1846), the author of *Frithiof's Saga*, is the greatest poet Sweden has produced. The best known writers of the modern period are Strindberg, the dramatist, and Selma Lagerlöf, the novelist, who in 1909 won the Nobel Prize for literature (see NOBEL PRIZES).

Government. The government is a constitutional monarchy. The throne is hereditary in the male line of descent, but in case there is no direct heir, a king is chosen by the national legislature. The king is required to be a member of the Lutheran Church and is bound to observe the laws and enforce the same. The legislative department consists of a *Dadjet*, comprising two houses, the upper chamber of 150 members chosen by the legislators of the various provinces, for six years, and the lower chamber of 230 members, chosen for three years by universal suffrage. In choosing the members of the lower chamber about one-third are chosen from the towns and two-thirds from the country. The exec-

utive power is in the hands of the king, who acts under the advice of a council of state consisting of eleven members.

Cities. The chief cities are Stockholm, the capital; Gothenburg and Mahmö. These are described elsewhere.

History. Authentic history of Sweden begins about A. D. 1,000, but for three centuries after that time the country was in a turmoil, owing to the constant struggles between the two Teutonic peoples, the Swedes and the Goths, who occupied, respectively, the northern and the southern parts of the peninsula. In the twelfth century Christianity spread through the country, and in their attempts to advance the new religion the Swedes made themselves masters of Finland. In 1397, by the union of Kalmar, Queen Margaret united Sweden, Denmark and Norway as one kingdom. The Swedes were restive under the union, but not until 1523, under Gustavus Vasa, were they able to make themselves independent (See GUSTAVUS I).

From this time the nation made a steady advance in the face of difficulties, despite the succession of weak rulers, the first of whom was Eric XIV, who ruled from 1560 to 1568. Under John III (1568-1592) occurred a reaction to Catholicism, from the Lutheranism which Gustavus had established as the State religion. The people showed their adherence to the new religion, however, by demanding the abdication of John's son, Sigismund, who attempted to restore Catholicism as the State faith. Charles IX (1604-1611) did much to counteract the bad effects which the previous reigns had had on the country, and his son and successor, Gustavus Adolphus (1611-1632), brought Sweden to a point which it had never reached before. With all of its growth in patriotism, commerce and culture, Sweden had made no attempt at territorial expansion, and it was not accorded by the other states of Europe a very high position. Gustavus Adolphus was ambitious, and his ambition, with his faith in Protestantism, was sufficient to draw him into the war which was raging in Germany. Even after the death of Gustavus Adolphus, his policy was carried out, and for some time Sweden was recognized as one of the great powers of Europe. Slight accessions of territory were made under several of the rulers by successes in war, but in 1675 the Swedish armies were completely defeated by the elector of Brandenburg at Fehrbellin.

The first great sovereign after Gustavus Adolphus was Charles XII (king from 1697 to 1718), whose extraordinary military genius drew the eyes of all Europe to Sweden. After his death the country became greatly enfeebled by the struggles of various political factions, and even Gustavus III (1771-1792), who put down the factions and increased the royal power, was unable to restore it fully. Finally, Gustavus IV (1792-1809) proved himself so weak, and yet so stubborn, that he was deposed and was compelled to renounce the crown for his heirs. Charles XIII, the uncle of Gustavus, was elected king, and as he had no heirs, Bernadotte, one of Napoleon's marshals, was chosen crown prince, in the hope of conciliating Napoleon. The effectual aid which Bernadotte rendered the allies in the final overthrow of Napoleon gave Sweden a claim on the Congress of Vienna, and Norway was accordingly taken from Denmark and given to Sweden. Barnadotte came to the throne in 1818, and although, because of his selfish desire for his own advancement, he was never personally popular, he greatly increased the prestige and prosperity of his realm. He was succeeded in 1844 by his son, Oscar I, under whom, as under the two succeeding kings, Charles XV (1859-1872) and Oscar II, prosperity continued. In 1905 Norway broke away from Sweden and became an independent country, but maintained friendly relations with Sweden. During the World War Sweden endeavored to maintain strict neutrality, in accordance with a common agreement entered into by the three Scandinavian countries.

Related Articles. Consult the following titles for additional information:

GEOGRAPHY

Baltic Sea	Malmö
Bothnia, Gulf of	Skagerrack
Cattégat	Stockholm
Gothenburg	

HISTORY

Charles, XII and XIV	Norway (history)
Denmark (history)	Oscar, I and II
Gustave V	Thirty Years' War
Gustavus, I, II, III, IV	World War

SWEDENBORGIANS, *swe den bor'je anz*, the followers of Swedenborg, particularly the members of what is called the New Jerusalem Church, or New Church. The belief of the Swedenborgians is as follows: Jesus Christ and God are one, in whom is a trinity, not of persons but of essentials, answering to the soul, the body and the operation of these in a man; that the Scriptures contain an internal or spiritual meaning, which is the Word

existing in heaven; that the key to this is the correspondence between natural and spiritual things, as between effects and their causes; that man is saved by shunning evils as sins and by leading a life according to the ten commandments; that man is a spirit clothed with a natural body for life on earth, and that when he puts off that body at death he continues to live as before, but in the spirit, first in an intermediate state between heaven and hell, but afterwards, when his character, whether good or evil, becomes harmonious throughout, among his like, either in heaven or hell; that the Lord's second coming and the last judgment are spiritual events, which are continually taking place. There are about 9,000 Swedenborgians in the United States.

Emanuel Swedenborg (1688-1772), whose real name was Swedberg, the founder of the New Jerusalem Church, or sect of Swedenborgians, was the son of Jasper Swedberg, bishop of West Gothland, Sweden. He was born at Stockholm. His education was scientific and his first work was that of assessor in the Royal College of Mines, a position he held till 1749, though he retained the salary through life. Swedberg was master of all the scientific knowledge of his time and wrote voluminously on scientific subjects. In 1719 Queen Ulrica raised his family to the rank of nobility, and the name was changed to Swedborg.

SWEET ALYSSUM, *a lis'um*, a little trailing plant dear to the heart of every gardener. It grows from four to ten inches high, and blossoms from June to September, in long clusters or bunches of small, white sweet-scented flowers, which are much frequented by bees. It is easy to raise, growing in any ordinary soil, either from seeds or from cuttings. One variety has double flowers, another is noted for its variegated leaves; still another, being dwarfed and bushy, is used perhaps more than any other plant for the borders of flower beds.



SWEET ALYSSUM

SWEET BRIER, a name applied to several species of rose, natives of Europe, but naturalized in the United States. Sweetbrier grows wild, but it is often planted in hedges and gardens, on account of the spicy fragrance of its small leaves and pink flowers. It is also called the *eglantine*.

SWEET CLOVER. See MELILOT.

SWEET FLAG, a rushlike plant of the arum family, found in marshy places throughout the northern hemisphere. The leaves are all long and sword-shaped, and the slender, green stem bears a spike of greenish flowers. The root, which is long, cylindrical and knotted, has a strong aromatic odor and a pungent, bitter taste. It has been employed in medicine since the time of Hippocrates. It is also used by confectioners in making candy and by perfumers in the preparation of aromatic vinegar and other articles. See ARUM.

SWEET GUM. See LIQUIDAMBAR.

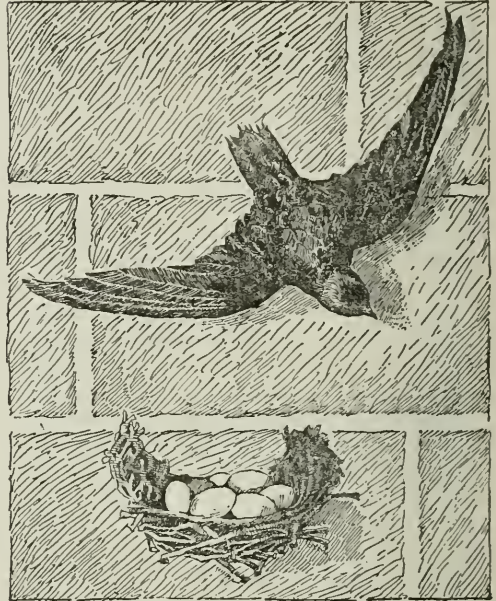
SWEET LOCUST. See HONEY LOCUST.

SWEET PEA, one of the most popular of all garden plants, related to the vegetable of the same name. There are about 150 varieties, belonging either to the climbing or the dwarf type. The flowers, which have a delicate fragrance, are white, pink, blue, red, purple and variegated. Sweet peas require a rich, well drained soil, plenty of sunlight and a free circulation of air. The seeds are planted in April in a trench which should be gradually filled as the plant grows in order to give the roots the necessary depth.

SWEET POTATO, a plant of the convolvulus family, a native of the tropics, but now cultivated in all the warmer parts of the world. Columbus carried sweet potatoes to Spain as a gift to Queen Isabella, and by the middle of the sixteenth century they were in general cultivation in that country. The sweet potato has smooth, creeping stems, heart-shaped leaves and a flower that somewhat resembles the morning-glory. The large root constitutes one of the chief American vegetables. Sweet potatoes are raised in nearly every part of the United States, Georgia, North Carolina, Mississippi and Alabama leading in the production. They are gathered after the first frost.

SWEET WIL'LIAM, a popular old-fashioned flower, a member of the pink family. The leaves are small, and the velvety flowers, ranging in color from white to dark red and purple, grown in thick clusters. The wild Sweet William belongs to the phlox family.

SWIFT, the common name of a bird, very much resembling the swallow in outward appearance and habits, but in structure much different and classified by some naturalists with the humming birds, and goatsuckers. Like the swallows, the swifts live principally upon the wing, catching insect food and even gathering material for their nests while in full flight. The common North American



CHIMNEY SWIFT

swifts are the so-called chimney swallows, which build their nests in fireless chimneys of houses, sometimes almost filling the cavity with the dried twigs, which are fastened together with a sticky glue, the saliva of the birds. The swifts hunt over a large territory during the day, and at night they return to their home in the chimney, where they move restlessly about, chattering throughout the night. Their tails are spiny-pointed and are used in climbing and propping themselves against walls. The famous edible birds' nest is built by a swift, almost entirely from its own saliva. The *cliff swift* of Guatemala builds a strange nest, about two feet long and two inches in diameter, with a chamber about six inches in diameter at the top, where the eggs are laid. The entrance is at the lower end.

SWIFT, JONATHAN (1667-1745), the greatest of English satirists, born in Dublin. Of his writings, the one most widely read to-

day is *Gulliver's Travels*. His education at Kilkenny and later at Trinity College, Dublin, was irregular, and it was only by a special dispensation that he was granted a degree. In 1689 he became secretary to Sir William Temple of Moor Park, Surrey, but his pride made this relation a trying one, and after five years he gave up the position and returned to Ireland, was ordained and was given a parish in the Irish Church. He shortly became dissatisfied and returned to Moor Park, where he remained until Temple's death. During this time arose his love for the *Stella* of his writings, Hester Johnson, a relation of Sir William Temple's and an inmate of his home. In 1699 Swift accepted an invitation from the Earl of Berkeley to accompany him to Ireland as chaplain and secretary, and through that nobleman he became vicar of Laracor and Rathbeggan.



JONATHAN SWIFT

The famous *Tale of a Tub*, published in 1704, brought Swift wide notice. But its satire on literary and religious pedantry injured his chances for advancement in the Church. In the years following he was prominent in politics, first as a Whig, later as a Tory and editor of the Tory *Examiner*, exerting a powerful influence by his writings. During a stay in England, from 1710 to 1713, Swift wrote the *Journal to Stella*, a work which throws much light on his life. In these years also he became acquainted with Miss Hester Vanhomrigh, called by him *Vanessa*, a young lady of fortune who fell in love with him and proposed marriage. When he returned to Ireland, she followed him and took up her residence in his neighborhood. At length, through secret means, she became aware of his attachment for Stella, and in desperation she visited Stella and demanded the truth. Swift's anger and the rupture of their friendship brought about her death.

In 1724 the publication of the *Drapier Letters*, in which he opposed the granting of a patent for copper coinage in Ireland, made Swift the hero of the Irish people; two years

later the appearance of *Gulliver's Travels* greatly increased his fame. His exertions to better the condition of the poor in Ireland remained constant until 1742, when the affliction which he had long been dreading came upon him, and his mind failed. His insanity continued until his death, three years later.

SWIMMING, a healthful and a pleasure-giving athletic exercise, a knowledge of the art may enable one to save one's own life and the lives of others, but probably not one-third of the boys and girls learn to swim. The chief obstacles to learning to swim are lack of confidence on part of the learner and fear of the mother, whose attitude is expressed by the old saying, "I would be perfectly willing that Johnny should learn to swim if he could learn without going into the water."

Lack of confidence is easily overcome if the beginner does not go into water over his depth, and if he will keep in mind the fact that the human body, as a whole, is lighter than water, but that some parts of it, especially the head, are heavier than water. The deeper one wades into the water, the greater its buoyant force, as one realizes by wading in until the water is up to the neck, when the feet can scarcely be kept on the bottom. However, when the beginner attempts to lie on the surface in water of this depth, it frequently happens that his feet rise and his head goes down, resulting in a "ducking" and sometimes giving him a fright from which he may not recover for some time. It is therefore wiser for the beginner to learn to lie in the water where it is not more than waist deep.

Wading out to this depth, let the beginner face the shore, then lie face downward in the water, extending the arms above the head, keeping the hands open, palm downward. Fully one-half of the head will be in the water and it will be necessary to hold the breath, but this can be done for a few seconds without any inconvenience. If the feet are drawn up quickly they will place themselves on the bottom and the floater can rise to an erect position at will. After a few exercises of this sort let the beginner open his eyes under water and then begin to paddle gently with his hands. He will observe that he is moving towards the shore.

Before attempting the swimming stroke one should be able to float as described above in perfect confidence. When this confidence has been gained, wade into the water up to

the neck, face the shore, lie in the water as before, but keep the head up so that the mouth is out of the water. As you assume this position extend the arms above the head with the hands together, then, turning the hands palm outward, swing the arms outward and backward at the same time, bringing the legs together till the heels touch. Bring the arms back to their former position and spread the legs, and the stroke is completed. In a short time you will be able to take a number of strokes, and when you have reached this stage you have learned to swim. Continued practice will increase facility of movement and also give confidence. Until one can swim some distance with confidence and without exhaustion he should keep out of water beyond his depth.

Diving. The dictionary says that *dive* means "to plunge headforemost into the water," and that is exactly what many do when diving. Every good swimmer will declare that diving, when one has learned the art, is very enjoyable. A good diver makes his plunge from a support high enough to enable him to enter the water in a nearly vertical position. The arms should be extended above the head, and the body while in the air should be straight, with the muscles as free from tension as possible. One will then enter the water easily and emerge quickly.

The inexperienced diver is likely to take his plunge from a support so near the water that he enters on an oblique line. When this happens, the diver suffers more or less inconvenience by having "the wind knocked out of him," when he strikes the water. A person should become a good swimmer before he attempts diving, and he may learn much by careful observation of experienced divers.

Rescuing from Drowning. If a person is in danger of drowning, and a swimmer goes to his rescue, the latter should remember that the drowning person is not apt to be conscious of what he is doing and may seize his rescuer and drag him down. If, however, there is no great excitement, the swimmer can support and carry the other very easily, if the latter will rest his hands upon the hips of the swimmer and, stretching at full length, keep perfectly quiet. This is a convenient method of bringing out any one who is attacked with weakness or cramp. If the drowning person is unconscious, his body

may be drawn along by the hair or pushed ahead of the swimmer, if far from shore; if near, he can be seized by the arm and drawn out. For treatment of the drowned, see **DROWNING**.

SWINBURNE, ALGERNON CHARLES (1837-1909), an English poet, born in London and educated at Balliol College, Oxford. His first important productions were two dramas. *The Queen Mother* and *Rosamond*, published in 1861. These were followed by the tragedies *Atalanta in Calydon* and *Chastelard* and a volume of verse, *Poems and Ballads*, which excited considerable criticism by reason of the unconventional ideas of morality they contained. Their metrical beauty, however, called for high praise. A series of political poems, including *A Song of Italy*, *Ode on the Proclamation of the French Republic*, *Songs Before Sunrise* and *Songs of Two Nations* reveal an entirely different phase of the author's genius. Among the works of his later years are *Bothwell*, *Mary Stuart*, *Erechtheus*, *Lochrine* and *Queen of the Lombards*.

SWINE. See Hog.

SWISS GUARD. The Swiss soldiers are famous for bravery, and for this reason they have often been chosen to serve as body guards of royalty. The Swiss Guard organized to protect Louis XIII was annihilated by the populace in an attack on the Tuileries in 1792. Its heroism is commemorated in Thorwaldsen's *Lion of Lucerne*, carved in the face of a rock at Lucerne, Switzerland. The Swiss Guard organized in 1815 as a body guard of Louis XVIII was overwhelmed in the revolution of 1830. The body guard of the Pope at Rome is made up of Swiss soldiers, but it is called the Papal Guard.

SWINTON, WILLIAM (1833-1892), a famous American historian, was born in Scotland, lived as a boy in Canada, then moved to the United States. He wrote a *History of the World, Twelve Decisive Battles of the War (Civil War)*, and other histories.

SWISS FAMILY ROBINSON, a story for children, written by J. R. Wyss (1781-1830), of Switzerland, in the German language. It was afterwards translated into French and then into English, has been accepted as a classic, and has been wonderfully popular for many years. The idea of the plot may have been derived from *Robinson Crusoe*, for the two tales are similar in their development.



A Swiss costume

SWITZERLAND, a small country of Southwestern Europe, one of the oldest republics in the world, having maintained a republican form of government for 600 years. Situated in the most mountainous part of the continent, it is famous for the grandeur of its scenery. This and the bracing climate attract many visitors. Because of its attractions for pleasure-seekers it has long been called the playground of Europe.

Switzerland has no seacoasts. North of it lies Germany; to the east is the new Austria; Italy and France form the southern and western borders, respectively.

General Features. Switzerland is the most mountainous country of Europe. Glaciers and perpetual snow cover 800 square miles. The dominating feature is the majestic Alpine range, extending across the central and southern parts of the country. Many of the peaks are more than 15,000 feet high. The famous Jungfrau rises two and a half miles above the sea; Monte Rosa, 15,217 feet. Towering to heights slightly less are Mount Saint Gotthard and the incomparable Matterhorn. The curve formed by the Jura Mountains serves as a great natural boundary in the north and west. Here are innumerable parallel ranges rising to heights approximately 5,000 feet. Long valleys lie between, and great gorges cross them, connecting one valley with another. Pine forests cover the slopes; many of the valleys are clothed in verdure and are rich pasture lands. Here and there, pocketed among the mountains, are small lakes and tarns of profound depths. Between the Juras and the Alps lies a great plateau 1,300 feet above the sea. Here the great mass of the population is to be found.

Owing to the melting snows the country is well supplied with water. Most of the valleys are crossed by streams, many of them broken here and there by picturesque waterfalls. The country is drained by the Rhine, the Rhône, the Ticino and the Inn and their tributaries within its boundaries. The only navigable stream is the Aar, a tributary of

the Rhine. The others, while too swift for navigation, are useful in supplying power for manufacturing. The lakes are remarkable for size, depth and beauty. In the southwest and northeast corners of the country respectively lie Lake Geneva and Lake Constance. Lying partly in Italy are Lake Maggiore and Lake Lugano, in the south. Lakes Neuchâtel, Lucerne, Zurich, Bienne, Brienz and Thun are of slightly less importance.

Climate, Plant and Animal Life. The climate of Switzerland is determined by altitude rather than latitude. In the low valleys the mean annual temperature is about fifty degrees Fahrenheit. This is the natural habitat of olives and grapes, of oaks and chestnuts. Higher up are forests of pine, larch, fir and beech, and rich pastures. Grain matures below 4,000 feet. The chief wild animals are the ibex and chamois. In the high valleys the climate is extremely severe. The limit of perpetual snow is about 9,000 feet.

People. The Swiss are a hardy race, noted for their industry, honesty and skill in the arts. They are of Celtic and Teutonic origin; the Teutonic element being more than double that of the Celtic. The latter are in three main groups—the Gallic, who speak French; the Italian, who speak Italian, and the Romanish, whose language is a Latin dialect. German, spoken by about sixty per cent of the people, is the dominating tongue of the northern provinces of Zurich, Bern and Lucerne; French, spoken by about twenty per cent, is the language of common intercourse in Geneva, Neuchâtel, Fribourg, Valais and Vaud.

Although made up of these diverse elements, the Swiss as a nation are one people. The severe test of national unity at the time of the World War served in the end but to intensify patriotism, to quicken the national consciousness. The melting pot of Europe, Switzerland preserves its national unity unimpaired by the activity of opposing forces within it. This is because the Swiss have a traditional passion for liberty, the common possession of which constitutes one great brotherhood among them. Moreover, the land is owned by the people. From the soil both men and women, working together, coax their meager subsistence from generation to generation. Trades pass from father to son. The limited resources have necessi-

tated frugality and thrift and these have engendered stability.

Cities. Since neither the soil nor climate is adapted to agriculture, there is not a large rural population. Most of the people live in the towns, which are thoroughly cosmopolitan. In them the peoples of all the countries of Europe come together. Zurich, with a population of 213,900, is the largest city; Basel, with 137,100, is next in size. Bern, the capital, and Lausanne are also prominent centers. In point of international importance the chief city of Switzerland is Geneva, situated near the French frontier, on the southern end of Lake Geneva, selected as the seat of the league of nations and "capital of the world."

Government. Switzerland is a confederation of twenty-two self-governing cantons, united under a central Federal government. The legislative and executive authority are vested in a parliament of two chambers, the *Ständerath*, or State Council, consisting of forty-four members, two from each canton; and the *Nationalrath*, or National Council, consisting of 189 representatives of the people, chosen by direct manhood suffrage for a term of three years. The two houses hold separate sessions in all legislative matters. In joint assembly they constitute the Federal Assembly (*Bundes-Versammlung*), the supreme government of the republic. This body elects a *Bundesrath*, or Federal Council, of seven for three years, a supreme executive body. The President of the Council, elected to serve one year, is also President of the Republic. The Council also elects a Supreme Court, and the commander in chief of the army. The Federal government can alone contract treaties and declare war. The army, finance, postal system and customs are under its direct control.

For purposes of local government the cantons are divided into districts and communes. With few exceptions each has a legislative and an executive council. The chief executive is called a prefect. In some cantons he is elected by the council of the canton; in others, by popular vote. Civil and criminal law, justice, police, public works and schools are under the jurisdiction of the cantonal authorities. The initiative and referendum have an important place in local legislation.

The neutrality of Switzerland is guaranteed by the Treaty of Vienna (1815) as indispensable to the peace of Europe.

Army. Switzerland has no standing army, but there is a national militia. With few exceptions, every male citizen between the ages of twenty and forty-eight is liable to military service. Exemptions are limited to Federal employes, policemen, clergymen, teachers and those physically unfit, and these pay a certain tax in lieu of service. Men between twenty and thirty-two constitute the *auszug*; those between thirty-two and forty the *landwehr*; those between forty and forty-eight, the *landsturm*. The soldier, on entering the army, is placed in the department of the service for which he seems best fitted—artillery, cavalry, etc. He has about a year's training in one of the recruit schools and afterwards has eleven days' training annually for seven years (eight, if he is a cavalryman). Each man takes home his arms and equipment and is required to keep them in good condition. When not on active duty he reports to the military authorities once a year. Part of Switzerland's army was mobilized at the time of the World War, when there seemed danger that the neutrality of the country would be violated.

Religion and Education. Complete liberty of conscience prevails, Jesuits alone being forbidden to carry on their activities. About fifty-nine per cent of the people are Protestant; forty per cent are Roman Catholics. Jews and non-orthodox make up the remainder. In all the cantons primary education is free; in the northeastern cantons, where the people are mostly Protestant, it is compulsory. In every district there are both primary and secondary schools. There are numerous technical and trade schools, and seven universities, located respectively at Zurich, Bern, Geneva, Fribourg, Basel, Lausanne and Neuchâtel. There is an excellent Federal polytechnic school at Zurich.

Production and Industry. The Swiss mountains, lakes and rivers render one-fourth of the surface unproductive. The lovely scenery, however, offsets this economic loss by attracting thousands of tourists annually; and the entertaining of visitors at the numerous summer and winter resorts constitutes the chief "industry" of the country. Only about ten per cent of the ground is under cultivation; the rest of the production area is covered with forests and pastures, called "alps." The most important products are cheese and condensed milk. Some rye, oats and potatoes are grown, but the bulk

of the foodstuffs are imported. Good wine is made in several cantons. Of domestic animals, cattle are first in importance. Pigs, goats and sheep are raised in large numbers. The lakes supply quantities of fish.

Salt and asphalt are the leading mineral products. Coal is scarce, but the deficiency is in a measure offset by an abundance of water power, and much attention is given to manufacturing. Swiss laces, embroideries, cotton goods and ribbons find ready acceptance in the world's markets. Watches, toys, jewelry and music boxes are widely known for their excellence. Minor industries are wood carving, straw plaiting, tool and instrument making and the manufacture of leather goods. At the time of the World War, Switzerland, in order to obtain necessary food, fuel and raw materials for its existence, guaranteed that (with few exceptions) no imports from one group of belligerents would be exported to an opposing group.

Transportation. Owing to the tempestuous nature of the streams there is little traffic by water. There are about 3,670 miles of railway, practically all of which is owned and operated by the government. Travel by coach and carriage is common, and the roads are kept in excellent condition. The postal and telegraph systems supply efficient means of internal and foreign communication.

History. The earliest inhabitants mentioned in written history were the Helvetians and Rhaetians, who were subdued by the armies of Rome. As a result of German invasions Switzerland was settled by the Alemanni and Burgundians. In the fifth century part of the country came into possession of the Franks. Under Charlemagne's successors the country was divided between France and Germany, but in the eleventh century it passed to Germany, becoming part of the Holy Roman Empire. As a result of the feudal system of the middle ages the Austrian counts of Hapsburg became powerful in the country. Their rule was burdensome and tyrannical, and in 1291 the men of Uri, Schwyz and Unterwalden entered into a defensive league. The union of these three cantons led to a struggle which was to end in Swiss independence.

Open hostilities began early in the fourteenth century, and in the conflicts which followed the Swiss displayed remarkable bravery and heroism. It is to this period that the story of William Tell belongs. In 1315

was fought the Battle of Morgarten, which resulted in a victory for the Swiss and a seventy years' peace. By the middle of the century the Swiss League was reinforced by the addition of five other cantons—Lucerne, Zurich, Glarus, Zug and Bern; and when, in 1386, war again broke out, the Swiss were again able to gain a victory. At the Battle of Sempach (1386), in which Arnold Winkelried deliberately sacrificed his life for the cause of liberty, and at Nafels (1388) the Austrians were overwhelmingly defeated. After this the cantons became the aggressors and wrested Aargau and Thurgau from Austria.

To maintain their independence in spite of the ambitious schemes of Charles the Bold of Burgundy, the Swiss were forced into another conflict, and from this also they emerged victorious. The last war with Austria occurred in 1499. The struggles were severe, but the Swiss again triumphed, and by the Peace of Basel they were politically separated from the Austrian Empire. By 1513 the number of cantons in the federation had increased to thirteen.

Early in the sixteenth century the Reformation, under the leadership of Zwingli and Calvin, began to spread through the country, especially in the northern cantons. The religious differences became so pronounced that war broke out in 1531. The difficulties between the two factions were partially adjusted by the Peace of Westphalia, which closed the Thirty Years' War.

Through the remainder of the seventeenth and the greater part of the eighteenth centuries considerable disorder existed in Switzerland. The religious and political differences of the cantons virtually prevented peaceful growth. In the last years of the eighteenth century the ferment of the French Revolution spread to Switzerland, and in 1798 the ancient confederation was replaced by the Helvetic Republic, which lasted four years. In 1803 Napoleon organized a new confederation, with nineteen cantons, and in 1814, by the Congress of Vienna, the powers acknowledged the independence of Switzerland and guaranteed its neutrality. Again in 1830 and in 1848, Switzerland was affected by the revolutionary movement in France, and a new Federal constitution was introduced in the latter year. This constitution remained in force until 1874, when it gave place to the present constitution.

Switzerland's position as a neutral during the World War was difficult. Its great problem was how to exist; how to obtain from the outside world the fuel, food and raw material on which the nation's life depended. Its next problem was how to remain unified, with its large German, French and Italian elements. The way in which the country overcame its difficulties commanded the respect of the world. In spite of its problems Switzerland conducted a highly-efficient Red Cross service for the relief of the injured.

Related Articles. Consult the following titles for additional information:

CITIES

Basel	Lucerne
Bern	Neuchâtel
Geneva	Zurich

RIVERS AND LAKES

Constance, Lake	Neuchâtel, Lake of
Geneva, Lake	Rhine
Lucerne, Lake	Rhône
Maggiore, Lake	

MOUNTAINS

Alps	Mont Blanc
Jungfrau	Rosa, Monte
Matterhorn	Saint Gotthard

MISCELLANEOUS

Calvin, John	Saint Bernard, Great
Chillon	Simplon
Mer de Glace	Tell, William
Reformation	Winkelried, Arnold

SWORD, *sohrd*, a weapon used in hand-to-hand encounters, consisting of a steel blade and a hilt, or handle, for wielding it. The blade may be either straight or curved, one-edged or two-edged. The ancient Greek swords were of bronze and later of iron. The Romans had short, straight swords, of finely tempered steel, sharp-pointed and with two cutting edges. When gunpowder was invented and heavy armor was discarded, the rapier came into favor. In the East the weapon most used is the scimitar, having a short, curved blade.

The sword is of much less importance in warfare than formerly, though it is used in all the armies of the world. The Japanese employ a two-edged sword from thirty to thirty-six inches long. The cavalryman of the French, the German and the British army is equipped with a long sword. In the United States army the sword has been replaced by the saber. In the World War hand-to-hand engagements were fought almost entirely with bayonets.

SWORDFISH, *sohrd'fish*, a large salt-water fish found in the Atlantic Ocean and the Mediterranean Sea and, less frequently, in the Pacific Ocean. It has an average length of eight feet and a weight of 250 pounds, though specimens of more than

twice this size and weight have been caught. That part of the fish which gives it its name is the long flat upper jaw, which is sharp-edged and strong and about half the length of the body. With this powerful weapon the fish overcomes its prey—herring, mackerel and menhaden. Even the timbers of ships have been rammed by its "sword." To kill this game fighter with a harpoon is considered fine sport by fishermen. The flesh is coarse, but well flavored.

SYCAMORE, *sik' a mohr*, a tree belonging to the plane tree family, which grows in the United States and Canada from New Brunswick to Florida, as far west as Texas and north into the province of Manitoba. It grows to a height of from seventy to a hundred feet. On the lower part of the tree the bark is brown; above and on the branches it is green and is characterized by a tendency to break off in pieces, exposing a lighter layer of bark underneath. The three-lobed leaves have scalloped edges and deep veins. The stamen-bearing flowers are deep red; the pistil-bearing blossoms are light green touched with red. Sycamore wood, reddish-brown in color, is very durable and is used in furniture-making.

SYDNEY, *sid'ni*, NOVA SCOTIA, the county seat of Cape Breton County, situated on Cape Breton Island at the head of an excellent harbor, 275 miles northeast of Halifax. It is near extensive coal mines, to which it owes much of its prosperity. It is the terminus of the Intercolonial and the Sydney and Glace Bay railways. The chief industries are shipbuilding, meat packing and the manufacture of iron and steel. It is the chief town of Cape Breton Island and is a naval station of some importance. Population, 1911, 17,723.

SYDNEY, NEW SOUTH WALES, the capital of the state, the chief naval station and the oldest city of Australia, and next to Melbourne the most important British city in the southern hemisphere. It is the headquarters of the squadron in Australian waters.

Situated on the southern shore of Port Jackson, five miles from the entrance of the harbor, the city has a beautiful site on a land-locked harbor with rocky shores, and it is defended by modern fortifications. The new town is well laid out and contains a number of beautiful public parks and promenades. In the center of the city is Hyde Park, from which the principal streets radi-

ate. The chief structures are the government building, the parliament house, the mint and the city library. The leading educational institution is the University of Sydney, in Victoria Park. Among the churches, the Cathedral of Saint Andrew and the Roman Catholic Cathedral of Saint Mary are worthy of mention. It contains the finest botanical gardens in Australia and the National Art Gallery. The manufactures include machinery, foundry products, cars, locomotives, stoves, boots and shoes, clothing, textiles, tobacco and malt liquors.

The city was founded in 1788 as a penal colony. In 1842 it was incorporated as a city, and after the discovery of gold in the colony, in 1851, it grew rapidly. It is connected by steamship with all the important ports and has an extensive trade. Population, 1917, 764,600, including suburbs (estimated).

SYDNEY MINES, NOVA SCOTIA, in Cape Breton County, on the north shore of Sydney Harbor. The Canadian government and the Nova Scotia Steel & Iron Company's railways furnish transportation. The last named corporation employs nearly 4,000 men in the mines, furnaces and foundries located here. The annual output of coal is over 900,000 tons. Practically the entire population is dependent on the coal mines, blast furnaces, steel plants, foundries and machine shops. Population, 1916, 9,054.

SYENITE, *sy'en ite*, an igneous rock composed of alkali feldspar with hornblende, augite, or mica. It differs from granite chiefly in the lack of quartz. The name is derived from Syene, Egypt, and typical representatives of the group are found in abundance in Saxony, Sutherlandshire (Scotland), the West Alps and Canada. The Norwegian augite syenites are employed as ornamental building stones and for monumental purposes.

SYLLOGISM, *sil'lo jiz'm*, in logic, a form of reasoning or argument, consisting of three parts, the first two of which are known as *premises* and the third as the *conclusion*, which is derived by joining in thought the two premises. Each premise contains two terms, of which one is common to both and is the means of bringing together the other terms. This common element is called the *middle term*. The subject of the conclusion is known as the *minor term*, and the predicate, as the *major term*. Correspondingly, the

proposition containing the minor term is the *minor premise*, and the proposition containing the major term is the *major premise*. In arranging the syllogism, it is customary to place the major premise first. The following is a good illustration of the arrangement and the method of combining the terms in a syllogism:

Autumn comprises September, October and November. (Major Premise.)

In the north central states the pleasantest season is autumn. (Minor Premise.)

Therefore, in the north central states the pleasantest season comprises September, October and November. (Conclusion.)

Here the middle term, *autumn*, brings into necessary connection the minor term, *in the north central states the pleasantest season*, and the major term, *September, October and November*.

There are six rules for the construction of a syllogism:

(1) Every syllogism must have three terms; no more, no less. If there were, for example, four terms, there would be no middle term, and consequently no conclusion would be possible.

(2) Every syllogism must have but three propositions. If there were more than three propositions, there would be more than three terms, and Rule 1 would be violated.

(3) The middle term must be distributed; that is, it must be referred to as a whole at least once in the premise.

(4) No term that is not distributed in one of the premises must be distributed in the conclusion. The error to which disregard of this rule leads is illustrated in the following:

All rabbits are rodent mammals.

No hares are rabbits.

Therefore, no hares are rodent mammals.

Here the major term, rodent mammals, which is not referred to universally in the major premise, is distributed in the conclusion; that is, an assertion has been made concerning the entire class of rodent mammals, namely, that hares do not belong to this class, which is false.

(5) No conclusion can be drawn from negative premises. For example, if A is not B, and E is not F, no inference of the relation between A and F can be made.

(6) If one premise is negative, the conclusion must be negative.

SYMBOL, a sign by which one knows or infers a thing; an *emblem*. It is commonly a definite, visible figure intended to represent or stand for something else. The common *astronomical symbols* are signs conveniently representing such things as astronomical objects, phases of the moon and astronomical terms. Some of these symbols are so ancient that we can find no satisfactory account

of their origin. The symbols for the chief heavenly bodies are as follows: Sun, ☉, Mercury ☿, Venus ♀, Earth ♂ and ⊕, Moon ☾, Mars ♂, Ceres ♃, Pallas ♁, Juno ♃, Vesta ♁, Jupiter ♃, Saturn ♄, Uranus ♅, Neptune ♆, Star ✱. Each asteroid, except those given above, is represented by a circle, with a special number within it. The phases of the moon are indicated in this manner: ☾ new moon; ☾ moon in first quarter; ☽ full moon; ☾ moon in last quarter.

The mathematical symbols are the symbols used to make operations in mathematics easier. Some are mere signs of value, like the numerals and the letters of the alphabet; others indicate processes, such as +, the sign of addition; −, of subtraction; ×, of multiplication, and ÷, of division. There are also signs of deduction, such as ∴ (therefore), and of aggregation '([]). Besides these, there are the signs of denominate numbers and the special signs used in geometry, trigonometry and the other branches of mathematics, all of which may be easily found in all good text-books on the subjects.

SYNAGOGUE, *sin'a gog*, the central place of worship for a Jewish community. The synagogue is believed to have originated at the time of the Babylonian captivity, in the sixth century B. C. In New Testament times the synagogues were so constructed that the worshipers, as they entered and as they prayed, looked toward Jerusalem. At the extreme east end was the holy ark, containing copies of the Pentateuch; in front of this was the raised platform, for the reader or preacher. The men sat on one side of the synagogue, and the women sat on the other, a partition five or six feet high dividing them. The chief seats, after which the scribes and Pharisees strove, were situated near the east end. The constitution of the synagogue was congregational, not priestly, and the sacred offices were not hereditary, but were filled according to the choice of the congregation. A college of elders managed the affairs of the synagogue and possessed the power of excommunication. The officiating minister was the chief reader of the prayers, the law and the prophets. The servant of the synagogue, who had general charge of the building, acted on week days as schoolmaster to the young of the congregation. The right of instruction was not strictly confined to the regularly appointed teachers, but the ruler of the synagogue might call upon any

one present to address the people; even a stranger might volunteer to speak. The *Great Synagogue* was an assembly, or council, of 120 members, said to have been founded and presided over by Ezra after the return from the captivity. Their duties are supposed to have been the remodeling of the religious life of the people and the collecting and editing of the sacred books of former times.

SYNCOPE, *sin'ko pe*. See FAINTING.

SYNECDOCHE, *sin ek'doh ke*, a figure of speech in which a part of a thing is used for the whole, or the whole for a part. Thus in the expressions, "All hands on deck" and "A fleet of forty sails," the word *hands* is used for men, and *sails* is used to designate ships. *Marble* is often spoken of for a statue, and the word *roof* is used when referring to a house. See FIGURES OF SPEECH.

SYNDICALISM, *sin'dik al iz'm*, a tenet of radical labor organizations having for its object the gaining of control of all industry by bodies of workers, as the control of mines by mine workers, the control of railroads by railroad workers, etc. The name is derived from *syndicat*, a term applied to a labor union in France where syndicalism is especially strong.

Syndicalism seeks the overthrow of present economic conditions, substituting therefor the industrial commonwealth, in which labor shall have control of all the means of production and appropriate to itself all the profits arising therefrom. Syndicalism teaches that there are only two classes in modern society—the capitalists and the laboring classes. There being no bond of sympathy between them, labor can only secure the enjoyment of its rights by the overthrow of the capitalist class.

Syndicalism does not believe that reform can be secured through legislation, neither does it have faith in revolutionary insurrections. It seeks to secure its ends by means of strikes, boycotts and sabotage, and by any other means that will curtail profits and discourage the capitalist class; and finally, when conditions are ripe for the movement, to overthrow the capitalist system by a general strike.

Standard labor unions have no sympathy with syndicalism, and their members are not admitted to syndicalist organizations. Syndicalism has developed considerable strength in France, Italy and some other European countries. The Industrial Workers of the

World (which see), combining some strength in the United States, advocate it. Bolshevism embodies many of the same ideas, to which it adds its own plan of wrecking industry by violence. The movement originated in France in 1892.

Related Articles. Consult the following titles for additional information:

Capital	Sabotage
Bolsheviki	Socialism
Labor Organizations	

SYNGE, *sing*, JOHN MILLINGTON (1871-1909), an Irish dramatist and poet, born near Dublin and educated there at Trinity College. After spending a number of poverty-stricken years on the Continent, he returned to Ireland, where he soon became associated with W. B. Yeats and Lady Gregory in the movement for the revival of the Irish drama and language. His first plays, *Riders to the Sea* and *In the Shadow of the Glen*, produced in 1905, are remarkable for their sense of the overpowering simplicity of tragedy. *The Playboy of the Western World*, though not his best work, is best-known. *Deirdre*, a play based on a classic Irish legend, is undoubtedly his greatest achievement. *The Well of the Saints*, *The Tinker's Wedding*, a few short poems and essays and a volume on *The Aran Islands* are among his other writings. A man of great imagination and remarkable delicacy of style, Synge is by many considered the greatest Irish poet of his time.

SYNOD, *sin'od*. See PRESBYTERIANS.

SYNTAX, *sin'taks*, that division of grammar which considers the arrangement of words to form sentences and the grammatical relations of words in the sentence. In the sentence, "The earth is a globe," the word *earth* is said to be the subject of the verb *is*, and the word *globe* is its predicate complement. The relation of each of these words to the verb is called its *construction*, or *syntax*. Since the subject is a singular noun and the verb is also singular, the latter is used grammatically. If the verb *are*, which is plural, were used, we would say that the sentence contained an error in syntax, or a grammatical error, for verbs must agree with their subjects in number. The study of syntax is thus the foundation of correct usage.

Related Articles. Consult the following titles for additional information:

Adjective	Language and	Participle
Adverb	Grammar	Preposition
Article	Interjection	Pronoun
Conjunction	Noun	Verb

SYNTHESIS, the union of various elements to form a compound. In philosophy,

the term is applied to the process by which a conclusion is reached through the building of a system of reasoning upon certain premises. It is, therefore, opposite to analysis, which consists in finding the elements or facts or characteristics of which a conclusion or notion is composed. In chemistry synthesis consists in building up a complicated compound from certain elements, and in this case, also, it is opposite to analysis, which is separating of a compound into its constituents.

SYRACUSE, *seer'a kuse*, ITALY, the most famous and powerful city of the ancient western Grecian world. It is situated on the east coast of the island of Sicily, thirty miles south-southeast of Catania. The town is built upon the little island of Ortygia, and is connected with the mainland by a mole. Syracuse of the present day is of little importance. The structures of greatest interest are the cathedral, built about an ancient Doric temple, known as the Temple of Diana, a few old palaces, and a museum of antiquities.

Ancient Syracuse, which at one time had over 500,000 inhabitants, was constructed on a high, triangular plateau, with precipitous sides. The colony was founded by the Corinthians under Archias, 734 B. C. It was captured by the Romans, after a three years' siege, in 212 B. C., and continued as a Roman possession until the downfall of the Empire. In 878 the city was destroyed by the Saracens, and the main portion has never been rebuilt. Population, 1915, 44,094.

SYRACUSE, N. Y., the county seat of Onondaga County, situated at the foot of Onondaga Lake, 148 miles west by north from Albany and about the same distance east of Buffalo, on branches of the New York Central and the Delaware, Lackawanna & Western railways. It is also at the junction of the Erie and Oswego canals (see NEW YORK STATE BARGE CANAL). The city is built upon a series of low hills and has a beautiful location. It has a large number of public parks, some of which are only small plots at the intersection of streets; but Burnet Park, on the west, contains over 120 acres, and Lincoln Park, on the east, has about twenty acres. The state fair grounds are also located here. The most important public buildings are the city hall, the courthouse, the Federal building, the new high school, a Carnegie Library, the state asylum for feeble-minded children, the county orphan asylum and the buildings of Syracuse University.

Syracuse is the fifth city in the state in industrial importance. Its industries include the manufacture of clothing, machinery, iron and steel, steel pipe, automobiles and automobile accessories, chemicals, pottery, boots and shoes, agricultural implements and typewriters. Salt is procured from springs on the borders of Onondaga Lake, and the industry has been maintained from the earliest times, though it is now of secondary importance. Near the city are the works of the Solvay Process Company, engaged in the manufacture of soda, coke, tar, ammonia, carbolic acid, nitric acid and other chemicals.

Syracuse is on land formerly occupied by the Onondaga Indians. The locality was visited by a Jesuit missionary in 1642. The first settlement at Syracuse proper was made in 1805, but the town did not reach any importance until after the completion of the Erie Canal. It was incorporated as a village in 1825, and in 1847 it was chartered as a city. Population, 1910, 137,249; in 1918, 161,404 (Federal estimate).

SYRACUSE UNIVERSITY, an institution of higher learning, founded at Syracuse, N. Y., in 1870, under the auspices of the Methodist Episcopal Church. It comprises the college of liberal arts, the college of fine arts, the college of medicine, the college of law, the college of applied science, the teachers' college, the college of agriculture and schools of library training, oratory and photography. It has a graduate department, conferring the master's and doctor's degrees, and it maintains a summer session of six weeks and a table at the marine biological laboratory at Wood's Hole, Mass. An observing station of the United States Weather Bureau was established here in 1902. On the campus there has been erected one of the largest stadiums in the United States. The New York State College of Forestry, a state institution, but a part of Syracuse University, was established in 1911. The university has a faculty of over 320 and an attendance of over 3,500. The library contains about 96,000 volumes and 40,000 pamphlets.

SYRIA, that portion of Asia Minor bordering on the Mediterranean Sea and extending eastward to the Euphrates River and

the Arabian Desert. The Alma Dagh Mountains form the northern boundary, and Syria extends to Egypt on the south. The area is estimated at 114,530 square miles, and before the World War the population was estimated at 3,675,000. In the southwestern part of Syria is the region known as Palestine, the scene of the birth, labors and death of Christ. Before the end of the World War Syria was a vilayet, or province, of the Turkish Empire. Its ultimate disposal was left to the decision of the victorious allies, with indications pointing toward the erection of a state under French or British protection (see **WORLD WAR**). The country is populated chiefly by Mohammedans, but Palestine is a great Jewish center. Bedouins and Arabs are found in numbers in the south. The chief towns are Damascus, Aleppo, Beirut and Jerusalem.

Related Articles. Consult the following titles for additional information:

Aleppo	Damascus	Lebanon
Arabs	Jaffa	Mountains of
Bedouins	Jerusalem	Palestine
Beirut	Jews	Turkey

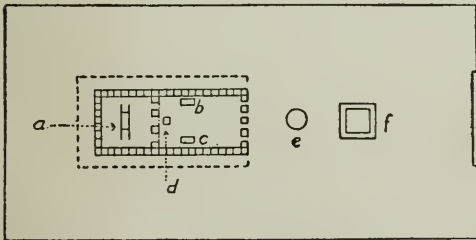
SYRIAC, a dialect or branch of Aramaic, and thus one of the Semitic family of languages. It was a vernacular dialect in Syria during the early centuries of the Christian Era, but it ceased to be spoken as a living language about the tenth century. A very corrupted form of it, however, is still spoken by a few scattered tribes, principally by the Nestorians, of Kurdistan and Persia. Syriac literature had its rise in the first century A. D. At first it was employed in ecclesiastical usage, Biblical translations and commentaries, hymns and liturgies, but in course of time it embraced history, philosophy, grammar, medicine and the natural sciences. The oldest extant work in the language is an incomplete translation of the Bible. The greater part of the Syriac literature has been lost.

SYRINGA, *si ring'ga*, a group of hardy shrubs belonging to the olive family, and including the syringa, the lilac and the jasmines, which are described under their titles. The syringa, which is a favorite garden shrub, bears an abundance of single white flowers, noted for their fragrance. It is common throughout the United States and Southern Canada, except in the arid regions.



T, the twentieth letter in the English alphabet, resembles in form the Phoenician character from which, through the Greek and Latin, it is derived, and with which it is identical in sound. In its phonetic value *t* corresponds most nearly to *d*, and the two are often interchanged in related languages. In combinations with *h*, *t* is pronounced in two ways, as in *thought* and as in *this*. When followed by *i*, *t* often has the sound of *sh*, as in *motion*, and in some words it is silent, as in *listen*.

TABERNAACLE, *tab'ernak'l*, in Jewish history, the tent of worship in which the sacred utensils were kept during the wanderings of the Israelites in the desert. It was in the shape of a parallelogram, 45 feet long and 15 feet wide, and it was 15 feet high. Its smaller ends were placed east and west, and its entrance was in the east. Its framework consisted of forty-eight gilded boards of shittim-wood, bound together by golden rings and set into silver sockets. The ceiling



PLAN OF TABERNAACLE

- a. Ark in the Holy of Holies.
- b. Table of show-bread.
- c. Golden candlestick.
- d. Altar of incense.
- e. Laver, or basin for washing.
- f. Altar of burnt offering.

and walls were covered with a curtain of linen, made in ten pieces. Outside this was a curtain of goats' hair, made in eleven pieces. Over this covering was thrown one made of skins.

The interior of the tabernacle was divided by a curtain into two compartments, the outer, the "sanctuary" proper, and the inner, the *holy of holies*. In the sanctuary was placed, on the north, the table of show-bread; on the south, the golden candlestick, and in the middle, near the inner curtain, the altar of incense. In the center of the holy of holies stood the ark of the covenant.

The tabernacle was situated in a court 150 feet long and 75 feet wide, surrounded by costly screens 7½ feet high, supported by pillars of brass 7½ feet apart, to which the curtains were attached by books and fillets of silver. In the outer, or eastern, half of the court stood the altar of burnt offering, and between it and the tabernacle itself was the laver, at which the priests washed their hands and feet before entering the sanctuary.

On the first day of the second year after the Israelites left Egypt, the tabernacle was dedicated. During all their wanderings a cloud rested on it by day, a pillar of fire by night. The Levites had charge of it, taking it down and putting it up at the various stopping places. The tabernacle lost its value and glory after the Philistines captured the ark. From Shiloh it was removed to Nob and then to Gibeon, whence it was taken to Jerusalem at the time of the dedication of Solomon's Temple.

TABERNALES, FEAST OF, an autumn festival of the Jews, to commemorate the time when their forefathers dwelt in tents during their sojourn in the Wilderness; it was also a feast of thanksgiving for the harvest and the vintage. The time of the festival fell in the autumn, when all the chief fruits were gathered in, and hence it is often called the "feast of the ingathering." Its duration was strictly only seven days, but it was followed by a day of holy convocation of great solemnity. During the seven days the

people lived in booths erected in the courts of houses, on the roofs and in the court of the Temple. With the final destruction of the Temple, the services attending this, the most joyous festival of the year, have since been conducted in individual synagogues, where a booth decorated with the harvest offerings is built upon the altar.

TABOO', a word used to indicate any object which by religious command may not be touched. The art and the practice were most common in the South Sea Islands. The taboo is applied not only to things with which, because of their evil nature, it is unsafe to come in contact, but also to things which are sacred. Thus, the person of the chief or king is usually tabooed, as is any piece of consecrated ground. In former times, in Polynesia, where the taboo was most in force, the penalty for breaking it was often death; in minor cases, the penalty was a confiscation of the goods of the guilty man. Of course, the practice was much abused, for it gave a priest or chief almost unlimited power over his people and enabled him by pronouncing a certain object tabooed, to gain possession of it for himself.

Taboo may be permanent or temporary, individual, private or public. When an individual is under taboo, whatever he may touch likewise becomes tabooed. The practice of private or public taboo is also noteworthy; as, a river is tabooed until the fishing season is over, a wood until the game is caught, or a field until the harvest is gathered.

TABOR, *tah'vor*, **MOUNT**, the most conspicuous and famous mountain in Galilee, situated in the northern part of Palestine, on the shores of the Sea of Galilee. It rises almost abruptly from the plain of Esdraelon to a height of about 1,000 feet, and it forms nearly a perfect cone. The altitude of the summit above sea level is about 1,850 feet, which affords an inspiring view of Galilee, Samaria and Perea, with their quaint villages, cultivated fields and water courses. Recent excavations show that the sides of the mountain contain many remains of ancient structures. As early Christians believed Tabor to have been the scene of the Transfiguration of Christ, it became the site of churches and monasteries as well as the object of many pilgrimages. A fortified town centuries before the time of Christ occupied its summit.

TABRIZ, *tah breez'*, **PERSIA**, the most important commercial center of Northwestern

Persia and second largest city of the country. During the World War it was captured by the Turks in June, 1918, and held by them until the close of hostilities.

Tabriz is situated on an elevation about 4,500 feet above the sea, thirty miles east of Lake Urumiah. It is surrounded upon three sides by hills. Many ruins attest the destruction caused by earthquakes. The inner section of the city is unattractive, despite its numerous mosques and well-stored bazars, but the suburbs are beautified by gardens and orchards. Much of its former commerce has been diverted to ports on the Caspian Sea, although it still enjoys a good trade in rugs, shawls and dried fruits. The rugs of Tabriz are counted among the finest of Persian rugs (see RUGS). Its leading articles of export are grapes, shawls and rugs. Population estimated at 200,000.

TACHE, *tash a'*, **ALEXANDER ANTONIN** (1823-1894), a Roman Catholic archbishop, born at Rivière du Loup, QUE., educated at St. Hyacinthe College, Montreal Theological Seminary and Chambly College. He became instructor of mathematics in St. Hyacinthe College in 1842, but resigned in 1844 to become a novice in the Order of the Oblate Fathers. He volunteered for missionary service among the Indians in the Red River Valley, and after an arduous journey reached



ARCHBISHOP TACHE

Saint Boniface, in August, 1845, two months after he had left his home on the Saint Lawrence. A great-great-grandson of Louis Joliette, and with the blood of Sieur Varennes de la Verandrye in his veins, it was natural that Taché should become a path-breaker. He was ordained a priest three months after his arrival at Saint Boniface, and soon became known throughout the great west for his zeal, fortitude and real friendship for the Indians, over whom he acquired remarkable influence.

In 1851 he was consecrated Bishop of Avath, after having been summoned to France by the Superior of the Oblate Fathers. In 1852 he returned to the Northwest and a year later became Bishop of Saint Boniface. He urged upon the government the necessity of adjusting the grievances of the Indians

and half-breeds in 1869, but during his absence in Italy in 1870 the Riel rebellion broke out. Taché hurried home, and was instrumental in securing peace. Had his advice been followed, trouble could probably have been averted. In 1871, Saint Boniface was made the metropolitan see, and Taché became archbishop of Manitoba. He died at Winnipeg, and was buried in the Cathedral of Saint Boniface.

TACITUS, *tas'e tus*, PUBLIUS CORNELIUS (about 55—about 115), a Roman historian, one of the greatest of all times. Of his education and early life little is known further than the limited facts gleaned from his occasional reference to himself and from a series of letters written to him by his friend and contemporary, the younger Pliny. Under Titus, by whom he was treated with distinguished favor, he became quaestor or aedile; he was praetor under Domitian, and he was consul under Nerva. In 78 he married the daughter of Gnaeus Julius Agricola, the celebrated statesman and general, whose life he afterward wrote. During several years' absence from Rome on provincial business, he probably gained his knowledge of the German people, which formed the basis of his *Germania*. After his return to Rome he lived in the closest intimacy with the younger Pliny. He had a very extensive law practice, and acquired a great reputation as an orator.

Four of his works are still extant: his *Annals*, in sixteen books (of which volumes seven to ten, inclusive, are lost), presenting an account of the principal events in Roman history, from the time of the death of Augustus to that of Nero; *Histories*, of which only four books and a part of the fifth are extant, treating of the year 69 and a part of 70; *Germania*, an account of the geography, manners and institutions of the various German tribes; and *Agricola*, a masterpiece of biography. His style is characterized by conciseness, variety and poetical coloring.

TACKING, in navigation, an operation by which a ship is enabled to beat up against a wind, by a series of zigzag courses, the sails being turned obliquely to the wind, first on one side and then on the other. *Going about* is another term for tacking; while the change is in progress the vessel is said to be *in stays*. See SAILBOAT AND SAILING.

TACOMA, *ta ko'mah*, WASH., third in size among the cities of the state, is the county

seat of Pierce County, twenty-eight miles south of Seattle, at the head of Commencement Bay, on Puget Sound and on the Northern Pacific, the Chicago, Milwaukee & Saint Paul and the Great Northern railroads and the Oregon & Washington Railroad & Navigation Company. The city has one of the finest harbors in the world and a beautiful location along the bay. The snow-capped Olympic Mountains stretch along the west, and Mount Ranier, locally known as Mount Tacoma, rises to a height of over 14,000 feet on the southeast. The Puyallup River empties into the bay here and helps to form the spacious harbor. Many steamship lines connect the city with all parts of the world.

The city is near one of the richest farming regions of the Northwest, containing, also, valuable timber lands and extensive coal mines. Along the harbor are many large electrically operated coal bunkers and immense grain elevators. In the exportation of wheat, Tacoma is one of the largest ports on the Pacific coast; the other leading articles of trade are flour, lumber, fish and fruit. There are over 400 factories; the chief industries are connected with lumber and lumber products; other large industrial plants include flour mills, foundries, car and machine shops, smelters, refineries, shipyards, and manufactories of furniture, wagons and various other articles. There are large railroad repair shops.

The city is an important educational center. Here are the College of Puget Sound, Pacific Lutheran University, Whitworth College, Annie Wright Seminary and several important Roman Catholic schools. The public high school has a manual training department; a Carnegie Library and the Ferry Museum of Art are also important educational features. There are two large parks, Wright and Point Defiance, the latter containing about 660 acres; there are nearly 1,100 acres in parks. The state hospital for the insane is located a few miles southwest, and the city also contains three hospitals and an orphanage. Other important structures are a city hall, a courthouse, a chamber of commerce, the Union Club House, a Federal building, the Northern Pacific Railway building, the Tacoma Hotel and several metropolitan office buildings and the high school. The place was settled about 1869. It was made the terminus of the Northern Pacific Railroad in 1873 and was organized as a city ten

years later, by the consolidation of New Tacoma and Old Tacoma. The city more than doubled its population between 1900 and 1910. Population, 1910, 83,743; in 1917, 117,446 (Federal estimate).

TACONIC, *ta kon'ik*, **MOUNTAINS**, a range of mountains forming a part of the boundary between New York and Massachusetts and extending northward into Vermont where they connect with the Green Mountains (which see). The Taconic range is an eastern extension of the highlands of the Hudson. The mountains are low, with rounded tops, and their sides are generally covered with forests or cultivated fields.

TADPOLE, the larval form in the life history of the frog or toad. After it hatches from the egg, it first looks like a mass of dark jelly with a head and a tail. Gills, eyes and mouth soon develop. In a short time the lungs replace the gills; the tail is absorbed and in its stead legs appear. This last stage marks the end of the tadpole metamorphosis and beginning of the mature period of development. See FROG.

TAF'FETA, a term which has been applied to various kinds of plain silks, but designates to-day a specific variety, which is thin, glossy and of a fine, plain weave, distinguished from grosgrain, corded silk, and from surah, twilled silk. The name is derived from a Persian word *taftah*, meaning *spun* or *woven*. Taffeta has the same appearance on both sides.

TAFT, **LORADO** (1860-), an American sculptor, teacher and lecturer, born at Elmwood, Ill. In 1879 he was graduated from the University of Illinois, and in the following year went to Paris, where he studied for three years at the Ecole des Beaux-Arts. In 1886 he settled in Chicago, his present home, where he became instructor in sculpture in the Art Institute and lecturer in the extension department of the University of Chicago.

One of the most widely known of his sculptures is a symbolic group, "The spirit of the Great Lakes," on the south façade of the Chicago Art Institute. He also designed the Fountain of Time for the Midway Plaisance of the World's Columbian Exposition. Other notable works include the *Washington Monument*, Seattle; *Columbus Memorial Fountain*, Washington, D. C.; *The Blind*, suggested by Maeterlinck's drama of that name; and *The Solitude of the Soul*. He is

the author of the *History of American Sculpture*, possibly the best work yet written on that subject.



TAFT, **WILLIAM HOWARD** (1857-), an American jurist and statesman, the twenty-seventh President of the United States. His career is a good example of the manner in which popular feeling regarding a public official rises and ebbs. No President ever began his service higher in the esteem of the people, or with a finer record of constructive achievement. Yet it was

his misfortune to lose his hold upon large numbers of his admirers early in his administration, and to be overwhelmingly defeated in his contest for reelection. On the other hand, in the years following his retirement from the Presidency he regained the confidence he had lost, even in the cases of some of his bitterest political foes of a former day.

Taft's fall from popular favor may be attributed largely to his conservatism in a period when progressive and even radical tendencies were the order of the day. He believed in making progress slowly, while the people, who had for years been stirred and inspired by the dynamic Roosevelt, were disinclined to admire deliberation. It was unfortunate, too, that Taft preferred to work in harmony with a faction of the Republican party which did not represent the best ideals of the mass of voters. Future historians, however, will probably write down his administration as constructive and forward-looking, and of the man himself they will say that he ranks high among those who have helped to make America a great nation.

Early Life. William Howard Taft was born on September 15, 1857, at Cincinnati, Ohio, of New England ancestry. His father, Alphonso Taft was one of the most distinguished citizens of the city, who became a judge of the Cincinnati superior court, and was appointed successively Secretary of War and Attorney-General by President Grant in 1876. The son attended the public schools of his native city and entered Yale University in 1874, from which, four years later, he was graduated second in a class of 121. In 1880

he ranked with one other for first honors in the graduating class of the Cincinnati Law School, and the same year was admitted to the Ohio bar. The children of the future President are of the same intellectual caliber; his eldest son, Robert, was graduated in 1913 with highest honors at the Harvard Law School, and his daughter, Helen Herron, was appointed dean of Bryn Mawr College in 1917.

Lawyer and Jurist. Before he began the practice of his profession Taft worked for a time as law reporter for the Cincinnati *Times*, owned by his half brother, Charles P. Taft, and later for the Cincinnati *Commercial*. In 1881 he became assistant prosecutor of Hamilton County, and from that time his advance was rapid. By 1887, seven years after his graduation from law school, he had reached the dignity of judge of the Cincinnati superior court, and in 1890 was appointed Solicitor-General of the United States by President Harrison. As Solicitor-General he was called upon to represent the government in several cases of major importance, such as the one involving the Bering Sea fisheries dispute and the test case regarding the constitutionality of the McKinley Tariff Act.

This act had been passed under a new ruling by Speaker Reed, whereby members present in the House were counted as present whether they voted or not. It had been the custom of the opposition to block legislation by creating a state of "no quorum," for members not voting had hitherto been counted absent. Taft argued that such tactics made null and void the clause giving the House the right to compel the attendance of absent members. His contention was sustained by the Supreme Court, and the new ruling of the Speaker was permanently established. For the period between 1892 and 1900 Taft served as judge of the sixth circuit of the newly-created Federal Court of Appeals, established to lessen the burdens of the Supreme Court. In this interval he was called upon to hand down decisions of far-reaching influence, especially in cases involving corporations and organized labor.



WILLIAM HOWARD
TAFT

Governor of the Philippines. Judge Taft had long been a national figure, when, in 1900, President McKinley appointed him head of the civil commission to preserve order in the Philippine Islands, recently ceded by Spain. The choice was widely approved. The commission, after a thorough investigation, restored civil government on July 4, 1901, and its chairman became the first civil governor. Governor Taft's record as colonial administrator added greatly to his popularity and reputation. Under his guidance a government was organized, roads were built, sanitation was introduced, schools, banks and postoffices were established and the good will of the natives was won. To settle the difficulties arising from the disposal of the friars' lands, Governor Taft made a personal visit to Pope Leo XIII, and successfully arranged for their purchase.

Secretary of War. In 1903, while he was still engaged in these important tasks, he was offered a place on the Supreme Court by President Roosevelt. To his regret Governor Taft felt obliged to decline an office entirely to his liking—partly because he knew his work was unfinished, and partly because the people of the islands begged him to remain. A year later, however, he was in a position to accept a place in Roosevelt's Cabinet as head of the War Department, to succeed Elihu Root. The President and his Secretary of War were fast friends and worked in admirable harmony. In 1906 Taft helped the Cuban government settle its internal difficulties by acting temporarily as governor of the island republic, and a year later he established American government in the Panama Canal Zone and visited the Philippines to be present at the first session of the Philippine Legislative Assembly.

Election to the Presidency. President Roosevelt, whose outstanding influence as a party leader was undisputed, was chiefly responsible for the nomination of Secretary Taft as Republican candidate for the Presidency in 1908. He checked the popular movement for his own reelection by declining to be a candidate for a third term, and threw all his influence to his distinguished Cabinet official. Taft was undoubtedly the most popular candidate next to the President himself, and he won both nomination and election easily. James S. Sherman of New York was the candidate for Vice-President. The Republican ticket won over the Democratic by

Administration of William Howard Taft, 1909-1913

THE PRESIDENT

- (1) Birth
- (2) Parentage
- (3) Education
- (4) As a lawyer and judge
- (5) Administrative positions
- (6) Character

II. GOVERNMENTAL AFFAIRS

- (1) Domestic
 - (a) Payne-Aldrich tariff
 - (1) Passed by special session of Congress
 - (2) Not satisfactory, many duties being high
 - (b) The insurgent movement in Congress
 - (1) In the House
 - (a) Changes in the rules
 - (b) Lessened power of the Speaker
 - (2) In the Senate
 - (a) Control by the regular leaders destroyed
 - (c) Commerce Court established
 - (d) Establishment of the Postal Savings system
 - (1) A bank of deposit
 - (2) Pays interest
 - (3) Savings accounts only
 - (e) Conservation a national issue
 - (f) Federal tax on corporations
 - (1) On profits above \$5,000
 - (2) One per cent
 - (3) Annual reports required
 - (g) Investigation of important questions
 - (1) Aldrich Monetary Commission
 - (2) Tariff Commission
 - (h) Prosecutions under the Sherman Anti-Trust Law
 - (1) Dissolution of the "tobacco trust"
 - (2) Dissolution of the Standard Oil Company of New Jersey

- (i) New Mexico and Arizona admitted as states
- (j) Children's Bureau created
 - (1) To study conditions
 - (2) To improve them
- (k) Parcel Post established
- (l) Sixteenth Amendment adopted; seventeenth Amendment proposed

(2) Foreign

- (a) Fisheries dispute with Great Britain arbitrated
- (b) Reciprocity with Canada
 - (1) Approved by United States
 - (2) Rejected by Canada
- (c) Treaty with Russia annulled

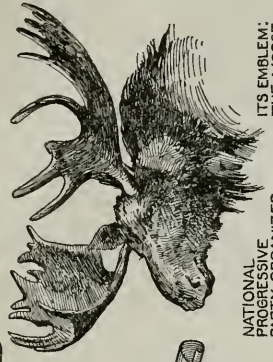
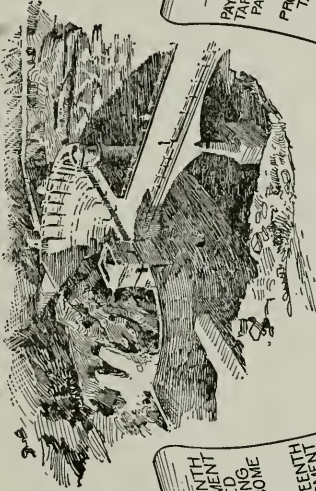
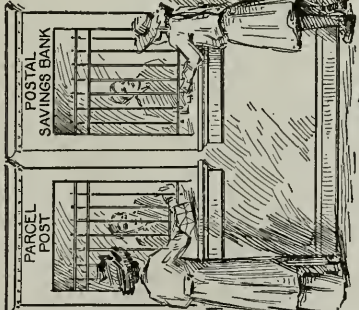
III. INTERNAL AND LOCAL AFFAIRS

- (1) The President's tour of the West in defense of his policies
- (2) The elections of 1910
- (3) Hudson-Fulton Celebration in commemoration of
 - (a) 300th anniversary of discovery of the Hudson River
 - (b) Centennial of Fulton's "Clermont"
- (4) Champlain Ter-centennial Celebration
- (5) Dedication of the Roosevelt Dam
- (6) Political changes
 - (a) Movement towards reform and reorganization
 - (b) Formation of the Progressive party
- (7) Election of 1912

Questions on Taft

- When was President Taft born?
 From what college did he graduate?
 What public offices did he hold before he became governor of the Philippines?
 Give an account of his work in the Philippines.
 What Cabinet position has he held?
 Describe the parcel post.
 What was the character of the Payne-Aldrich tariff?
 What states have been admitted since 1909?

1909 TAF T'S ADMINISTRATION 1913

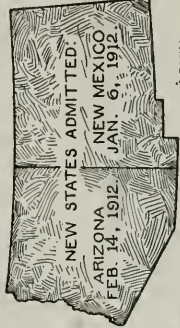


NATIONAL PROGRESSIVE PARTY ORGANIZED
ITS EMBLEM: THE MOOSE

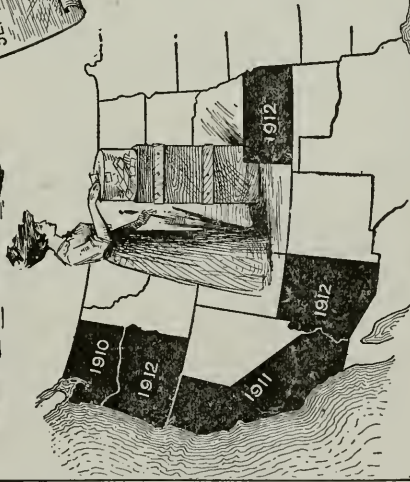
SIXTEENTH AMENDMENT ADOPTED PROVIDING FOR INCOME TAX.
SEVENTEENTH AMENDMENT ADOPTED FOR DIRECT ELECTIONS SENATORS

ROOSEVELT DAM COMPLETED

PAYNE-ALDRICH TARIFF LAW PASSED 1909.
PROTECTIVE TARIFF



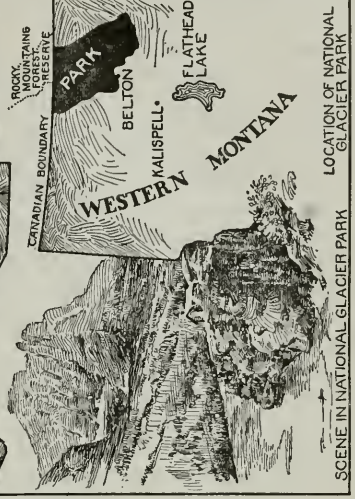
NEW STATES ADMITTED:
ARIZONA FEB. 14, 1912
NEW MEXICO JAN. 6, 1912



FIVE MORE STATES ADOPTED WOMAN SUFFRAGE—SEE PAGE 173

PRINCIPAL EVENTS

- 1909
Hudson-Fulton Celebration
- Payne-Aldrich Tariff Law
- 1910
Commerce Court Established
- Fisheries Dispute with Great Britain Ended
- Glacier National Park Created
- 1911
Postal Savings Banks in Operation
- Canadian Reciprocity Law Rejected by Canada
- Roosevelt Dam Completed
- 1912
New Mexico and Arizona Admitted
- Formation of Progressive Party
- Children's Bureau Organized
- 1913
Parcel Post in Operation
- Department of Labor Established
- 16TH and 17TH Amendments



SCENE IN NATIONAL GLACIER PARK

an electoral vote of 321 to 162. Taft had about 1,260,000 more popular votes than his rival, William J. Bryan.

Administration. *Domestic Affairs.* When President Taft commenced his term he was thought to be wholly in sympathy with the policies of Roosevelt, and to favor the element in the Republican party which was generally known as progressive. There was another faction in the party which believed in more conservative policies, and the opposition between the two elements increased noticeably within a few months. It was not long before the public began to feel that the President was working away from the progressives. One of his first official acts was to call a special session of Congress to revise the tariff. The result was the Payne-Aldrich Law, which greatly disappointed the country in general, in that it did not "revise downward" to any extent. The passage of this law and the President's subsequent defense of it in a speech at Winona, Minn., reacted strongly against him, as did his neutrality in the fight against Cannonism and his refusal to take a stand against his Secretary of the Interior, Richard Ballinger, in the latter's controversy with Gifford Pinchot.

Ballinger and Joseph G. Cannon were prominent conservatives, or "stand-patters." Pinchot, who was head of the Forestry Bureau, charged Secretary Ballinger with irregularities in granting claims to Alaskan coal lands and with other violations of the Roosevelt conservation policies. In January, 1910, after Pinchot had appealed to the Senate over the President's head, the President removed him for insubordination, and though Ballinger was subsequently exonerated by a Senatorial committee, the public generally sided with Pinchot.

In the fight on Cannon, who was Speaker of the House, the issue between the progressives and conservatives was so clearly drawn that the progressive sentiment of the country was disappointed when the President refused to encourage the efforts made to change the rules of the House. The progressives won their fight to deprive Cannon of some of his autocratic power, but without the President's help, and, apparently, without his sympathy. These events had sufficient influence to cause a Democratic victory in the Congressional elections of 1910. In 1911 the new Congress passed several tariff reform bills, which were promptly vetoed.

In the meantime some very excellent measures were passed. In 1910 the postal savings bank system was established; in the same year a Commerce Court was organized, and the Interstate Commerce Commission was given enlarged powers. In 1912 the Children's Bureau was organized in the Department of Commerce and Labor; this department was divided in 1913 when the new Department of Labor was created. One of the most popular measures of the entire administration was the act providing for a parcel post (August, 1912). This was an innovation which the public had been demanding for years.

Other notable measures and events include the adoption by Congress of the Sixteenth and Seventeenth amendments (the latter effective in Wilson's administration), providing for the levying of income taxes and the direct election of Senators; the creation of Glacier National Park; the admission of Arizona and New Mexico as states; the completion of the Roosevelt Dam; the passage of an act providing for publication of campaign contributions in national elections; and the addition of five states to the list of full suffrage states. In dealing with trusts the administration fully adhered to the policy established by Roosevelt. Suits were brought against scores of trusts, and the Standard Oil and tobacco combines were ordered dissolved by the Supreme Court.

Foreign Affairs. There is no doubt that in the conduct of international relations the Taft administration deserves high praise. The President worked zealously for reciprocity and arbitration treaties, though the results were somewhat disappointing. Arbitration treaties with France and Great Britain, ratified by the Senate in 1912, were so modified by that body that the President would not submit them to the governments in question. A reciprocity treaty negotiated with the Canadian government was defeated in Canada by vote of the people. The principle of arbitration was upheld, however, in the settlement of the Atlantic fisheries dispute with Great Britain. A new diplomatic policy was also inaugurated, that of creating international good will for the United States through the agency of trade and commerce. An example of this so-called "dollar diplomacy" was Secretary of State Knox's suggestion to American bankers to participate in an international loan to China. In 1912 he made a

tour of the Latin American countries in order to bring about closer commercial and political relations between those countries and the United States, and was cordially received everywhere. Toward the close of the administration disturbances in Mexico in connection with the Huerta revolution caused anxiety for the safety of Americans along the border, and 15,000 troops were sent there as a precautionary measure. The President refused to recognize the Huerta government, and the same policy was followed by the next administration.

The Republican Split of 1912. As has been intimated, a revolt against President Taft by the progressive Republicans had gained great headway by the close of 1910. That year Ex-President Roosevelt returned home from his African hunting trip, and a movement to have him resume his political leadership soon began to take form. Senator La Follette of Wisconsin was the avowed candidate of the progressives, but his physical collapse and limited popularity checked the movement in his behalf. Early in 1912 seven state governors issued a joint letter to Roosevelt urging him to become a candidate. The question of the nomination was fought out in several states in the primaries, in the majority of which Roosevelt was successful. He was, however, unable to control the nominating convention, as the committee on contests and the convention chairman, Elihu Root, were a part of the Taft organization. Claiming "fraud" and a "stolen nomination," the Roosevelt delegates withdrew from the convention hall, the Chicago Coliseum, and held a protest meeting in another hall, nominating their candidate by acclamation. Later in the summer Roosevelt and Governor Johnson of California were formally nominated by the new Progressive party convention (for other details see ROOSEVELT, THEODORE). With the Republican party thus divided, the Democrats won an easy victory in the fall elections. Taft secured eight electoral votes, those of Utah and Vermont. Roosevelt secured eighty-eight and Woodrow Wilson, 435. The popular vote was 3,483,922 for Taft, 4,126,020 for Roosevelt, and 6,286,214 for Wilson.

As Ex-President. Taft accepted his defeat in a dignified manner, and when his term of office was finished he accepted the post of Kent professor of law at Yale University. From time to time he expressed himself forcibly on questions of national interest,

especially on President Wilson's foreign policies. He was very critical of the administration plan to give the Philippine Islands their independence. Taft became chairman of the executive committee of the Red Cross in 1916, and was also made president of the League to Enforce Peace. When the country entered the World War no other public man worked more sincerely to help carry the struggle to a victorious conclusion, and in order to give his full energies to the cause he temporarily abandoned his university lectures. Meanwhile he became fully reconciled to his old friend Theodore Roosevelt; old animosities were forgotten in the nation's crisis. During the period following the armistice Taft spoke and wrote energetically in favor of President Wilson's plan for a League of Nations, and the organization of the League to Enforce Peace was used to advance the movement.

Related Articles. Consult the following titles for additional information:

Conservation Nations, League of Philippine Islands Pinchot, Gifford	Political Parties in the United States Tariff Trusts
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TAGORE, *ta gahr'*, SIR RABINDRANATH (1860-), an Indian (Bengalese) poet, philosopher and religious teacher, winner of the Nobel Prize for literature in 1913. For many years before he became an international figure he was known as the prophet of Bengal. His poems, dramas, short stories—in fact, all his writings—are filled with deep religious faith. He is inspired by things spiritual and idealistic, and his sympathetic understanding of the beauties of nature is marvelous. Tagore is primarily an interpreter of the East, and although he traveled extensively, his works rarely reveal the influence of Western civilization.

Tagore was born in Calcutta of a distinguished family. At the age of seventeen he went to Europe to complete his education. Returning to India, he became famous as an educator and philosopher, and he founded a university in Bengal. He has translated many of his own works into the English language. Although these are inferior to the originals, they interpret their spirit, and many excel in their technique. Among the most widely known of these translations are *Gitanjali*, *The Crescent Moon*, *the Gardener*, *Chitra*, *Short Stories*, *The Post Office* and *The Realization of Life*.

Tagore has spent some time in America, and in 1916 he made a lecture tour through the country, his subject being "Internationalism." His patriotism won for him the title of "the Soul of Bengal," and his writings have had a powerful influence in developing a national consciousness among his people. He was knighted by King George in 1915.

TAHITI, *tah'he te*. See SOCIETY ISLANDS.

TAHOE, *ta'ho*, or *tah'ho*, LAKE, the largest lake in the Sierra Nevada range, on the boundary between California and Nevada. It is a beautiful glacial lake, twenty-two miles long and about ten miles broad, with the mountains of the two states reflected in its remarkably clear waters. Tahoe lies at an elevation above sea level of 6,225 feet and discharges through the Truckee River into Pyramid Lake, and it has been planned to draw its water through tunnels for irrigation purposes. Lake Tahoe is a noted summer resort, and its vicinity is dotted with attractive homes and fine hotels.

TAIL'OR BIRD, a song bird native to India, Malaysia and the Philippines, so named from its curious habit of sewing leaves to-



TAILOR BIRD

gether to form a nest. It encloses its nest within a large leaf, the ends of which it sews together with threads picked up with its slender bill. The nest itself is made of cotton and other soft materials. The tailor bird has a back of olive green and white under parts, and the crown of its head is chestnut. It belongs to the family of true warblers.

TAINÉ, *tayn*. HIPPOLYTE ADOLPHE (1828-1893), a French historian and critic, born at Vouziers. In his early youth he developed

scholarly habits and adopted a rigid program for study which enabled him quickly to distinguish himself. At the age of twenty-three he became professor of philosophy in the University of Toulon, but resigned the position to give his time to study and literary production. His *History of English Literature*, one of the best and most philosophical works on the subject, appeared in 1864. In the same year he was appointed a professor in the school of Fine Arts, Paris, where he won renown with a series of lectures on art. He produced many critical studies on history, literature and art, among them *The Origin of Contemporary France*, a monumental work, the result of wide research. In 1878 Taine was elected a member of the French Academy. His works continue to hold a high place by reason of their logical and accurate analyses.

TAJ MAHAL, *tahj mahahl'*, the greatest masterpiece of Indian architecture, and the most magnificent edifice of the seventeenth century. It was built outside of the city of Agra by Emperor Shah Jehan, about 1650, as a burial place for his favorite wife, Mumtaz-i-Mahal, "the pride of the Palace." The name "Taj Mahal" is the Persian for *Crown of Mahal*.

This famous mausoleum is of white marble, 185 feet square, situated in the center of a court 315 feet square. The four corners of this court are adorned with four elegant minarets, and over the whole is an exquisite white marble dome fifty-eight feet in diameter and eighty feet high, rising over four corner chapels, each crowned with a dome. The decorations consist of arabesque, mosaics and passages from the Koran in inlay work of precious stones of unsurpassed beauty. Because of the translucent alabaster dome and the windows equipped with perforated alabaster screens, no artificial lighting is required for the interior, as the light filters through these with a marvelously mellowed effect. A beautiful walled-in garden surrounds the structure, the cost of which is estimated at over \$10,000,000. See ASIA, full-page plate, *Some Types of Civilization in Asia*.

TALC, *talk* (short sound of *a*), a soft magnesium mineral, consisting of broad, flat, smooth layers or plates, soapy to the touch, of a shining luster; it is translucent and often transparent, when in very thin plates. There are three principal varieties of talc, *common*, *earthy* and *indurated*.

Tale is a silicate of magnesium, with small quantities of potash, alumina, oxide of iron and water. It is used in many parts of India and China as a substitute for window glass. A variety of tale, called *French chalk*, or steatite, is used for tracing lines on wood and cloth. Tale of the higher grade, used in the manufacture of toilet powders and gas tips, is largely imported from Italy and France.

The United States produces more tale than all the rest of the world, the output of marketed tale averaging 170,000 tons a year. Tale is found chiefly in the Blue Mountain region of the Atlantic states and in the hills of New England; it is generally mined in small fragments by underground methods. New York state leads the states by producing over one-half of the total output.

TALENT, a unit of weight and money used by the Greeks, Hebrews and other ancient peoples. As a unit of both weight and value it varied widely among the Greek states, but two standards predominated. In one of these the talent weighed 37.8 kilograms, and in the other about 26 kilograms. Upon the latter unit the largest coin used by the Greeks was based, its value being a little more than \$1,000. As a weight among the Greeks it was divided into 60 *minas* and 6,000 *drachms*. The Romans also had monetary units called *great talents* and *little talents*, the former being worth about \$480 and the latter about \$363. In other countries at different times the talent varied in weight from 30 to 43 kilograms.

In present-day usage the word *talent* applies to a special endowment or faculty, derived from the parable of the talents as narrated in *Matthew XXV*.

TALISMAN, *tal' iz man*, a figure cast or cut in metal or stone, and made, with certain superstitious ceremonies, at some particular moment of time, as when a certain star is at its culminating point, or when certain planets are in conjunction. The talisman thus prepared is supposed to exercise extraordinary influences over the bearer, particularly in averting disease. In a more extensive sense, the word is used, like amulet, to denote any object of nature or art, the presence of which checks the power of spirits or demons and defends the wearer from their malice. Relics, rosaries and images of saints were once used as talismans.

TALKING MACHINE. When Sarah Bernhardt was asked to present a play for

the moving pictures, she said, "Now I shall live a thousand years." Her countrymen and other lovers of her art may likewise hear her voice a thousand years hence, for she has spoken her "lines" into a talking machine. But Madame Bernhardt is not the only one whose voice has thus been preserved. Caruso, Melba, Tetrizzini and many other great singers, actors and orators have spoken their voices into the "records."

First given to the world as a curiosity, the talking machine has become one of the most useful of modern inventions. It enables every home and school to hear the voices of the greatest singers and orators and the music of the greatest composers, and it preserves these records for future generations. It also has become a valuable aid in the business world, where it is replacing shorthand in correspondence.

The talking machine, or *phonograph*, as it was first called, was invented by Thomas A. Edison, though the origin of the idea is credited to another. The original machine consisted of the following essential parts: There was first a curved tube, one end of which was fitted to a mouthpiece, while the other end, which was about two inches in diameter, was closed with a disk of very thin metal. To the center of this disk was attached a steel point, or stylus, which, when sounds were projected on the disk from the mouthpiece, vibrated so as to give an exact reproduction of the vibrations received by the mouthpiece. This part of the apparatus was adjusted to a cylinder which rotated on a horizontal axis. On the surface of the cylinder a spiral groove was cut, and on the axis there was a spiral screw of the same pitch, which worked in a nut.

When the instrument was to be used, a piece of tin foil was gummed round the cylinder, and the steel point was so adjusted that it just touched the tin foil. If words were spoken through the mouth piece and the cylinder was kept rotating, a series of small indentations was made on the foil by the vibratory movement of the steel point. These markings had an individual character, due to the various sounds addressed to the mouthpiece, and when the point was made to pass over the cylinder the second time, the sounds spoken into the mouthpiece were reproduced.

Improvements. The first phonograph was a crude instrument, and its performances were not wholly pleasing, but it showed the

possibilities the instrument would possess when it was perfected. The first marked improvement of the phonograph introduced in 1885, consisted in the substitution of a wax cylinder for that covered with tin foil. The wax cylinder was the invention of Chichester A. Bell and Charles S. Tainter, and the inventors called the improved machine, the *graphophone*. Two years later the *gramophone* appeared. In this machine a disk took the place of the cylinder, and the stylus cut upon the disk a zigzag groove of uniform depth, instead of varying depths, as on the cylinder. The gramophone was invented by Emile Berliner, and all instruments of recent make are based upon his invention. The various later patents are for modifications or attachments which make the machine more nearly perfect, and so well have the inventors succeeded that the best machines return an almost perfect reproduction of the sounds they receive.

A large trumpet-shaped horn was used with the graphophone to intensify the sound. All modern instruments have a sound chamber containing a sounding board similar to that in a piano. The best instruments are in handsome cases which are an ornament in the most elaborately furnished homes. Much attention has been given to perfecting the "needle," or reproducing stylus, and some instruments are fitted with diamond-pointed needles that resist all wear. Machines are known by their trade names. The *Victor Talking Machine*, the *Disk Graphophone*, the *Columbia Phonograph* and the *Edison Diamond Disk* are all modifications of the Berliner's gramophone.

TALLAHASSEE, *tal a hass'ee*, FLA., the capital of the state and the county seat of Leon County, 165 miles west of Jacksonville and twenty-five miles north of the Gulf of Mexico, on the Sea Board Air Line, and the Georgia, Florida & Alabama railroads. It is the junction point of the main line of the Dixie Highway and the old Spanish Trail, is picturesquely situated near several beautiful lakes, and has a semi-tropical climate. The place is rapidly becoming modernized, and has brick paved streets and a golf course that is one of the finest in the South. The Florida State College for Women, the Florida State Normal and Industrial College and the Florida Agricultural and Mechanical College for colored students are located here. There are two high schools, the "Sein" for white and the "Lincoln" for colored children. Important

buildings are the capitol, the Governor's mansion, the Supreme Court Library and the Federal building.

Tallahassee is situated in an agricultural district which produces cotton, tobacco, sugar cane and dairy products. It is not important industrially, but there are cottonseed-oil, tobacco and canning factories, and ice, furniture and novelties are manufactured. The town was laid out in 1824 on a site previously selected as the seat of the territorial government. It was incorporated as a city in 1827. Population, 1910, 5,018; in 1915, 5,193.

TALLEYRAND-PERIGORD, *tah la rahN' pa re gor'*, CHARLES MAURICE, Duke de, Prince of Benevento (1754-1838), a French statesman ranking next to Napoleon as one of the greatest historical figures of his day. He was born in Paris and was educated for the Church. In 1788 he was consecrated bishop of Autun, despite the immorality of his life. On the meeting of the States-General in 1789, he was elected deputy for Autun, where his advocacy of the union with the Third Estate ranked him at once as one of the leading reformers.

State Rights Above Church. Talleyrand was appointed a member of the commission to draft a constitution for his nation. In 1789 he assisted in framing the Declaration of Rights and proposed the confiscation of Church property as belonging to the right of the nation. In 1790 he was elected president of the National Assembly. In 1791 he was sent to London on a diplomatic mission, and during his stay there was proscribed for alleged royalist intrigues. Forced to leave England by the provisions of the Alien Act, in 1794, he sailed for the United States. In 1796 he returned to France, and in the following year was appointed Minister of Foreign Affairs. In this capacity he negotiated with the three American envoys sent by President Adams to adjust commercial difficulties between France and the United States (see X Y Z CORRESPONDENCE).

Napoleon and Talleyrand. He devoted himself entirely to Bonaparte, whom he had early recognized as the master spirit of the time, and after Bonaparte's return from Egypt, Talleyrand contributed greatly to the events which led to the fall of the Directory and the establishment of the Consulate. He was then reappointed Minister of Foreign Affairs, and for the next few years was the executor of all Napoleon's diplomatic

schemes. After the establishment of the Empire, in 1804, he was appointed to the office of Grand Chamberlain, and in 1806 was created Prince of Benevento.

After the Peace of Tilsit, in 1807, a coolness arose between him and Napoleon, which became more and more marked. In 1809 he resigned his office, and in 1814 helped to secure Napoleon's abdication. He took part in the Congress of Vienna, and in 1815, when the allies again entered Paris he became Minister of Foreign Affairs. After a short time he resigned this position and retired to private life. When the revolution of July, 1830, broke out, he advised Louis Philippe to accept the throne, and held several diplomatic offices under the new government. His last important public act was in the capacity of ambassador to England, when he succeeded in forming the quadruple alliance of France, Great Britain, Spain and Portugal. Before his death it is recorded that he became reconciled to the Church.

Estimate. Talleyrand stands out as a foremost type of the unscrupulous diplomat and politician. Even though a skeptic in religion and loose in morals, he guided France many times through stormy periods when conditions made the wisest course impossible to foresee.

TALLOW, a solid fat, obtained from animals, especially cattle and sheep, by subjecting the carcasses to steam heat in closed kettles. Beef tallow of the best quality comes from the fat around the kidneys; that of a cheaper grade is obtained from the caul and other tissues. Tallow is purified by heating to a high temperature and then straining. When cold, it is white and hard, resembling lard, except that it is somewhat whiter. The most extensive use of tallow is in the manufacture of soap; it is also employed in the manufacture of candles, lubricants, and in dressing leather. A specially prepared tallow is used in making oleomargarine. A substance similar to animal tallow is obtained from certain trees. See OLEOMARGARINE; TALLOW TREE.



TALLOW TREE

TALLOW TREE, the name of several trees which produce a tallowlike substance, used for making candles. One of the largest and most beautiful, and the most widely distributed of the plants is found in China, where it is called the *candle tree* and the *wax tree*. From a remote period it has furnished the Chinese with the material out of which they make candles. The capsules and seeds are crushed together and boiled; the fatty matter is skimmed as it rises, and it condenses on cooling.

The tallow tree has been introduced into the United States, and is almost naturalized along the coasts of the Carolinas and Georgia. In addition to candles, a soap emitting a balsamic odor is made from it. The leaves furnish a black dye; the stem yields a resinous substance, called *copal*, an ingredient in the making of varnishes.

TALMAGE, *tal'maje*, THOMAS DE WITT (1832-1902), a great American clergyman and pulpit orator, born at Bound Brook, N. J., and educated at New York University. After holding several charges he served as pastor of an important Presbyterian church in Brooklyn (1869-1894), which came to be known as "The Tabernacle." Talmage gained a great reputation for his eloquence, remarkable oratory, and fearless denunciation of existing evils. His influence was further spread through his lyceum work and the syndication of his sermons throughout the country; they were likewise translated into many foreign languages. His sermons were written in popular vein and characterized by fantastic figures of speech.

From 1895 to 1899, Talmage was assistant pastor of the First Presbyterian Church, Washington, D. C. He lectured widely in America and England, was editor of *The Christian at Work* (1873-1876), *The Advance* (1877-1878), *The Christian Herald* (1890-1902), and was the author of several published works, including *The Pathway of Life, From Manger to Throne*, and *Every-Day Religion*.

TALMUD, **THE**, the book of Jewish civil and canonical law not comprised in the Pentateuch. It consists of two parts: the *Mishna*, or the laws written in Hebrew; and the *Gemara* or commentary on the law, written in Aramaic, into which crept many anecdotes, proverbs, legends and some history, so that it might be called a cyclopedia of rabbinical knowledge.

The *Mishna*, meaning *instruction*, comprising sixty-three treatises, is composed of six main divisions: (1) on tithes, agriculture, etc.; (2) on festivals, feasts and the Sabbath; (3) on marriage, vows and oaths; (4) on penal laws and ethics; (5) on sacrifices, including a description of the Temple of Jerusalem; (6) on purifications.

The *Gemara* included the discussions on the *Mishna* by the rabbis of Babylon and Palestine, from the third to the sixth century, when the two were brought together in a final compilation. In the *Gemara* doubts are resolved, duties explained and the most minute circumstances relative to the conduct of life are fully discussed.

The Talmud is especially valuable to students of religion, history and language. It had its beginnings in the time of Ezra, in the period of Exile, when new conditions of national life called for new laws. Translations are found in English, French and German.

TALUS, the heap of broken rock that forms at the base of cliffs and steep mountain slopes. It varies from a few inches to many feet in thickness, depending upon the size of the cliffs and the length of time which it has been under formation. The rocks are broken off by weathering, usually by the repeated freezing and thawing of water in their crevices. Where the fragments are coarse, the inclination of the talus is very steep; where they are fine, it is more gradual. An old talus contains more fine rock than a new one, since the fragments are continually undergoing decomposition and forming soil. See **EROSION**; **SOIL**.

TAMARACK, *tam'a rak*, an American timber tree common in swamps. It grows from thirty to ninety feet in height and its resinous wood is valued for posts, ties, poles, etc. In Western and Southern United States it is called the *larch*; in New England and Canada, *hackmatack*. See **LARCH**.

TAMARIND, *tam'a rind*, a large, beautiful tree, native of the East and West Indies. Its pods are filled with a sweet, delicately-flavored pulp, which, together with the seeds it contains, is preserved in sugar, packed in layers in casks and shipped in large quantities into Europe and America, when it becomes the preserved tamarind of commerce. The seeds are used to make yellow and red dyes. The wood, especially in the roots, is beautiful, but it is so hard that it is difficult to work. It is valuable for cabinet work.

The tamarind is widely distributed in warm countries, and in the United States has been successfully cultivated only in Florida.

TAMBERLANE. See **TIMUR**.

TAMBOURINE, *tam boor een'*, a musical instrument of the drum type, consisting of a piece of parchment stretched over the top of a broad hoop, which is furnished with little bells. It has no musical pitch and is used merely to beat rhythm. It is sounded by sliding the fingers along the parchment, or by striking it with the knuckles or with the fist or the elbow. It is a favorite instrument among the peasants of Spain and Italy, and was long used in Egypt. It is similar to the *timbrel* of the Old Testament. The tambourine is largely used in Salvation Army bands and in some of the modern dance music.

TAMMANY, *tam'a ni*, **SOCIETY**, a powerful political organization in New York City. The name was adapted from that of an Indian chief, Tamanend, of the Delaware tribe, who, according to tradition, was wise and virtuous and friendly toward the white man. The society was founded in New York City, May 12, 1789, for the purpose of promoting the cause of independence. The original members were those who, prior to the Revolutionary War, had been members of such patriotic organizations as the Sons of Liberty; and in its beginnings the society was purely patriotic and fraternal in aim. The worthy causes it aided were many. In



TAMARIND

promoting friendly relations with the Indians, in advancing the cause of education and in undertaking enterprises of an even more dis-

tinctively patriotic character it demonstrated its usefulness. Gradually there grew up within the society a strong political element, which identified itself with the Democratic-Republicans, as opposed to the Federalists. In time this wing of the society dominated the whole body, converting it into a powerful political machine.

The society first took an active part in a political campaign in 1800, when it carried New York for Jefferson. From that time to the present it has been recognized as the local representative of the national Democratic party. It has exercised a powerful influence on state politics and a preponderating influence on the politics of the city. From 1834 to 1913, it elected two-thirds of the mayors. The strength of the society lies in its hordes of adherents, largely of the foreign element, living on the East Side of New York City and in other congested districts, whose loyalty it gains by manifesting a sort of paternal interest in their material welfare.

Such an organization as Tammany places great power in the hands of a few of its leaders. The result has been numerous cases of fraud and corruption. In 1871 William M. Tweed, head of the "ring," was found guilty of having carried on a gigantic scheme of bribery whereby he had robbed the city of millions of dollars, and he was imprisoned. Twenty-five years later another notorious leader was Richard T. Croker, who was succeeded by Charles F. Murphy. For about twenty years Tammany has controlled fully half of the time the government of the City of New York.

TAMPA, FLA., the second city in size in the state and the county seat of Hillsboro County, 212 miles southwest of Jacksonville, on Tampa Bay, at the mouth of the Hillsboro River, and on the Atlantic Coast Line, the Sea Board Air Line, the Tampa & Gulf Coast and the Tampa Northern railroads. The city has an attractive location and a healthful climate, and has become a popular winter resort. Special features of interest are the De Soto Park, where the United States volunteers camped during the Spanish-American War; the Athletic Grounds; the Tampa Bay Hotel, municipally owned; the old government reservation, and the Convent of Holy Names. Large quantities of phosphate, fruits, vegetables, turpentine, rosin, lumber, fish and cattle are exported from Tampa, while the port is second only to New York in the importation

of tobacco. Cigar making is the principal industry, 300,000,000 Havana cigars being turned out annually. Fertilizer is also manufactured. Fishing is an important industry. Tampa was occupied as a military post during the wars with the Seminoles (1835-1842). It was incorporated and made a port of entry in 1886. About the same time the tobacco business began to be developed, and the city has since grown steadily. Population, 1910, 37,782; in 1917, 56,251 (Federal estimate).

TAMPICO, *tahm pe'ko*, MEXICO, the country's most important center of distribution of oil production and one of its leading seaports. It is situated on the Gulf of Mexico, at the mouth of the Tampico River, 206 miles north-east of Mexico City.

Tampico has a good harbor, which is protected by a breakwater and a jetty. The town is well laid out; it has broad streets and a number of public monuments, and it contains naval and military hospitals. Most of the buildings are of the Spanish type of architecture. It is an important commercial port and carries on a good trade with Great Britain and the United States. Despite its hot, unhealthful climate, the city has enjoyed a remarkable boom because of the development of the rich oil fields in its vicinity. In 1914 Tampico was the scene of an insult to the American flag which almost led to war between the two countries. During the World War the oil wells of Tampico provided almost all of the oil used by the British navy. Estimated population, 35,000.

TANAGER, *tan'a jur*, a family of birds, closely related to the finches, noted for the brilliance of the male plumage. Of the 350 known species, dwelling chiefly in the tropical regions of Central and South America, its representatives in America are of five species, only two of which, however, reach into Canada.

The *scarlet tanager*, except for its black wings and tail, is covered with brilliant scarlet plumage, which makes him the brightest of all the birds of the northern United States. Its nest is a rather loose structure, placed in trees, and its eggs are pale blue, spotted with brown. The *summer tanager* is rose-red all over, brighter in tint below, though the female is rather dull in color, being a yellowish-green. It is native to the Southern states and has the same nesting habits and song as the scarlet tanager. The *Louisiana*, or *Western*, *tanager* is found in the summer from the

Rockies to the Pacific coast. The male of this species is bright yellow, with black back, tail and wings and crimson head.

TANANARIVO: See **ANTANANARIVO**.

TANCRED, *tang'kred* (about 1050–1112), one of the most famous heroes of the First Crusade. He was a Prince of Antioch and distinguished himself at the siege of Nicaea, at the Battle of Dorylaeum, at the capture of Jerusalem, and at Ascalon. He was made Prince of Galilee by Godfrey de Bouillon. Tancred is represented by Tasso, in the *Jerusalem Delivered*, as the flower and pattern of chivalry.

TANEY, *taw'ny*, **ROGER BROOKE** (1777–1864), a famous Chief Justice of the United States Supreme Court, who gave the decision in the Dred Scott Case (see **DRED SCOTT DECISION**). He was born in Calvert County, Md., and educated at Dickinson College. He was admitted to the bar in 1799; and was elected to the state senate in 1816 as a Federalist, but he later joined the Democratic party and supported Andrew Jackson. The latter, in 1831, appointed him Attorney-General of the United States, and in 1833 Secretary of the Treasury. In 1836 Taney succeeded John Marshall as Chief Justice of the Supreme Court.



ROGER BROOKE
TANEY

As a jurist he displayed marked ability and great learning as a lawyer, though he reversed the previous tendency of the court toward centralized government and stood firmly for state sovereignty. Many of his decisions were severely criticised, especially that in the Dred Scott Case, and the one denying the right of the President to suspend the writ of *habeas corpus*.

TANGANYIKA, *tahn gan ye'ka*, one of the largest and deepest fresh-water lakes in the world, its area being estimated at over 12,000 square miles. It is situated east of the central part of Africa, lying on the borders of the Congo Free State and what was formerly German East Africa, and its greatest extent is from northwest to southeast. Its length is about 400 miles, and its width varies from twenty to forty miles.

Tanganyika occupies a narrow basin, enclosed by an almost continuous series of hills and mountains. It is fed by a number of rivers and discharges its waters by the Lukuga, on the west, into the Lualaba, or Upper Congo. The surface is noted for its changes of level caused largely by periods of rainfall and dry weather. The lake has but few shoals or reefs, but there are numerous floating islands of vegetation, densely forested with palms. Severe hurricanes and tornadoes make navigation perilous; its waters abound in fish, crocodiles and hippopotami.

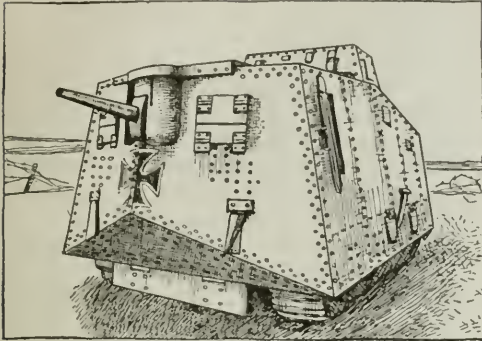
The lake was discovered by Burton and Speke in 1858, and later was explored by Livingstone, Stanley and other travelers. The chief towns on the shore are Ujiji, Bismarckburg and Albertville. The lake is navigated by steamers and is connected with Lake Nyassa by a carriage road 210 miles long. In 1914 Belgium began construction of a railroad to traverse the region between the Upper Congo and the west shore of Tanganyika (see **CAPE-TO-CAIRO RAILWAY**).

TANGERINE, *tan'jer een*, a variety of orange, so named from Tangier, Morocco, where the first specimens were found. It is flatter and deeper in color than the orange. The peel is easily removed from the pulp, which is sweet, juicy, and highly prized because of its flavor. The tangerines are said to have been produced in the United States from the mandarin orange; they are cultivated in most of the states bordering on the Gulf of Mexico.

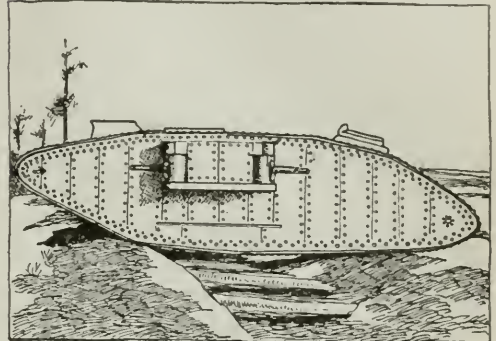
TANGIER, *tan jeer'*, or **TANGIERS**, a seaport and the diplomatic capital of Morocco, situated near the western entrance of the Strait of Gibraltar, thirty-six miles southwest of the town of Gibraltar. Its site is at the head of a spacious bay, and when seen from the sea, the town presents a striking appearance, rising in the form of an amphitheater. The houses are nearly all of one story and are built along lanes or narrow streets, many of which are too steep to admit of the use of carriages. There are a few modern residences, occupied by Europeans and by the most wealthy merchants. The city also contains a number of mosques, a Roman Catholic church and several Jewish synagogues. It is lighted by electricity. The harbor is fairly good, and the trade is considerable, though in the last half century it has materially fallen off. The city is the center of a caravan trade of some importance, and most of

its exports go to the cities of southern Europe. In 1662 it became a possession of Great Britain, but was abandoned after

vention. These tanks were first used in the Battle of the Somme, September 15, 1916, where they proved their value in preparing



GERMAN TANK



ENGLISH TANK

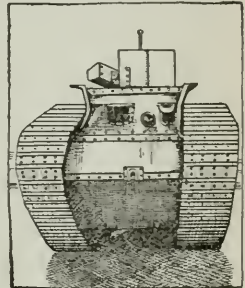
twenty-two years. Population, estimated, 46,000.

TANK, ARMORED, an armored automobile constructed on the plan of the caterpillar tractor. The largest tanks are about thirty feet long and about the width of an automobile truck, and they weigh from thirty to forty tons. Their distinctive feature is the endless track which is propelled by the motor wheels in the interior. Their form and construction are readily understood from a study of the accompanying illustrations. The armament of the small tanks consists of machine guns, but the large ones carry in addition one or two small field guns. The entire structure is enclosed in bullet-proof armor.

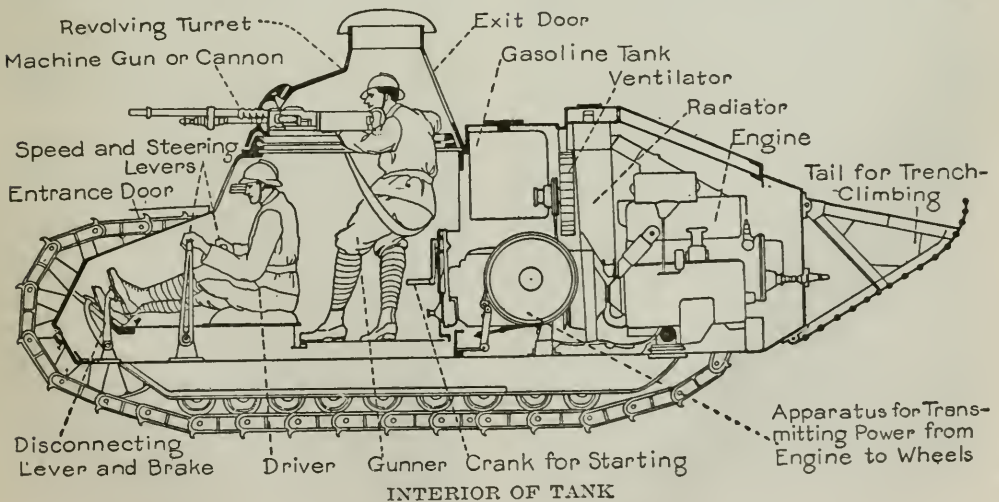
The armored tank was devised in the British War Department and is based upon the caterpillar tractor, which is an American in-

the way for the infantry. Their speed is relatively slow—from three to ten miles per

hour—but their progress is practically irresistible. They can break down barbed wire entanglements, crush machine gun emplacements, and climb into and out of trenches like huge mud turtles. The slow but ceaseless progress of these ungainly monsters at the Battle of the Somme struck terror to the hearts of the Germans, most of whom fled or surrendered without offering resistance.



FRONT VIEW OF THIRTY-TON MODEL



Following the Battle of the Somme, the allied armies added tanks to their equipment as fast as they could be manufactured, and they were of the greatest assistance in forcing back the lines of the enemy in the fierce fighting before the signing of the armistice, in November, 1918. See **WORLD WAR**.

TANNHAUSER, *tahn'hoi zur*, in old German legend, a knight who gained admission into a hill called the Venusberg, a region in the Thuringian Forest, in the interior of which Venus held her court. For a long time Tannhauser remained buried in sensual pleasures, but at length heeded the voice of the Virgin Mary, who called upon him to return. The goddess allowed him to depart, and he started upon his pilgrimage to Rome to seek the Pope's absolution. The Pope, however, when he learned the extent of the knight's guilt, declared that it was as impossible for him to obtain pardon as it was for the wand in the Pope's hand to bud and bring forth green leaves.

Despairing, Tannhauser retired from the presence of the pontiff and entered the Venusberg once more. Meanwhile the Pope's wand actually began to sprout, and the Pope, taking this as a sign from God that there was still opportunity of the knight's salvation, hastily sent messengers into all lands in quest of him, but Tannhauser was never again seen.

Richard Wagner adopted this legend, with modifications, as the subject of one of his operas. *Tannhauser* was first produced in Dresden in 1845, and it since has had conspicuous place in the repertoire of all European and American opera companies. Of its many exquisite melodies, the *Pilgrims' Chorus* and *Address to the Evening Star* are the most familiar. Swinburne's poem, *Laus Veneris*, is based on the legend, and it has been treated by Heine, Tieck and other poets.

TANNIN, *tan'in*, or **TANNIC**, *tan'ik*, **ACID**, a substance prepared by extraction from powdered gallnuts, by means of a mixture of alcohol, ether and water, from which it is obtained by evaporation. It is almost colorless and odorless, has a bitter taste and is used as an astringent in medicine, as a mordant in dyeing and, in combination with other substances, as coloring matter in ink. Similar substances are prepared from other vegetable growths and are sometimes called *tannic acid*; such as *alder tannin*, *caffetannic acid* (prepared from coffee berries) and *fraxitannic acid*, from leaves of the ash tree.

TANNING. See **LEATHER**.

TANSY, a well-known plant of the Composite family, abundant in Great Britain and throughout Europe, and naturalized in many parts of the United States. It is a tall plant, with divided leaves and button-like heads of yellow flowers. Every part of the plant is bitter. Tansy tea is an old popular medicine, believed to be a fine tonic. Tansy is now cultivated in gardens, and grows along roadsides. The young leaves were formerly used for flavoring cakes, puddings, etc.

TANTALUS, in Greek mythology, a son of Jupiter, and king of Phrygia, Lydia, Argos or Corinth, who was admitted to the table of the gods, but forfeited their favor, either by betraying their secrets, stealing ambrosia from heaven, or presenting to them his murdered son Pelops as food. As punishment he was plunged into a deep pool with water up to his chin, but, plagued by an unquenchable thirst, the waters receded from his lips when he attempted to drink. Crazed by the never-ceasing pangs of hunger, he was tempted by delicious fruit which hung above him, and which withdrew when he tried to partake of it. According to other accounts, a huge rock forever threatened to fall and crush him. The word *tantalize* is derived from this legend.

TAOISM, *tou'iz'm*, a system of philosophy originated in China in the sixth century. Lao-tse is commonly regarded as the founder of the faith, although it is probable that the religion had existed before his time and that he gave it more definite form. The Chinese of to-day rank Lao-tse with Confucius. The principles underlying his philosophy are difficult to explain, but he strove to bring out the best in human action and endeavored through right conduct to point the way to true happiness.

After the entrance into China of Buddhism, Taoism adopted many of the peculiarities of the new faith. It degenerated into superstition and mysticism; to-day the ritual is a combination of witchcraft and demonology, void of the slightest tinge of resemblance to the teachings of Lao-tse. See **CHINA**, subhead *Government and Religion*.

TAPAJOS, *tah pah zhosh'*, one of the principal tributaries of the Amazon River, rising in the middle west of the south-central part of Brazil and flowing northward into the Amazon. Its length is about 1,200 miles, and it is navigable for small boats to with-

in a few miles of its source; the last 200 miles are navigable only for large vessels.

TAPESTRY, an ornamental fabric used for wall decoration in churches and palaces and as covering for windows and furniture. Tapestry is made by a special process of weaving, whereby colored wool threads are interwoven with undyed warp threads after the warp threads have been stretched on the loom. The varied colors of the wool threads produce the pattern. The work is done with an instrument that is a combination of shuttle and bobbin; needles are never used in tapestry weaving. The so-called Bayeux Tapestry, in the Bayeux Library, Normandy, is really a piece of embroidery. It probably was given its name because, like many tapestries, it pictures elaborate historical scenes (see **BAYEUX TAPESTRY**).

Flemish and French Tapestries. Tapestry weaving dates from antiquity. As mentioned by Homer, Penelope and Andromache each wove picture tapestries, while Helen of Troy wove on tapestry the story of her own tragic life. However, the art reached its supremacy in the fifteenth century, when the industry was centered in Arras, Flanders. So excellent and distinctive were the tapestries there made that to identify them they were given the name of the city of their manufacture. Antwerp, Brussels, Bruges, Lille and Valenciennes became such important centers that the art of tapestry making became nationalized in France and in Flanders.

Gobelin Tapestry. In the seventeenth century, a factory under royal patronage was established in Paris in the dye works of the Gobelin family, which, in 1662, was organized as a state institution. Gobelin tapestries became renowned the world over, and the present museum in connection with the establishment and one in Florence are the only two museums in the world housing nothing but exhibits of tapestries and textiles. In addition to reproductions of many masterpieces of painting, famous Gobelins reproduce historical scenes of French history, notably events during the reigns of Louis XIV and XV.

English Tapestries. A notable English industry was established in 1619, at Mortlake, near London, continuing in existence until 1703 and following closely the French example. William Morris founded a tapestry works at Merton, near London, in 1881, which is still in operation. The most famous ex-

amples produced here are from the designs of Burne-Jones, with foliage, flowers and borders originated by Morris.

American Tapestries. The first tapestry works in the United States was established on Fifth Avenue in New York City in 1893, and later was removed to Williamsbridge. Its most significant designs follow the style of French eighteenth-century examples. Three other tapestry plants have been established in New York City since the time of the initial experiment.

Famous Collections. The world's most famous tapestries are the "Acts of the Apostles" series at the Vatican, designed by Raphael for Pope Leo X for the Sistine Chapel (see **SISTINE CHAPEL**). These wonderful examples revolutionized the art, substituted Italian for Flemish; even Flemish painters succumbed to the Italian style. Raphael's tapestries were copied by weavers, engravers and painters. The woven examples are now the prized possessions of the Royal Spanish, the Austrian and the French National collections, and of the Berlin and Dresden museums. The South Kensington Museum of England contains a collection of famous hunting tapestries. The most important early fifteenth-century tapestry in the United States is the Burgundian Sacraments in the Metropolitan Museum of art.

TAPEWORM, *tayp'worm*, an animal parasite found in a mature state in the alimentary canal of warm-blooded vertebrates. Tapeworms are composed of a number of flattened joints, or segments, attached to a head, which is furnished with a circle of hooks, or suckers, enabling it to maintain its hold on the mucous membrane of the intestines. The other segments are simply buds, given off by the head, the oldest being farthest removed from it; each is capable of reproducing a perfect worm. The tapeworm has neither mouth nor digestive organs, and absorbs its nutrition through the skin. The length of the animal varies from a few inches to several yards. A person afflicted with tapeworm has a ravenous appetite; he loses weight, has abdominal pains, and is generally restless and weak. Eating of ill-cooked pork or beef is responsible for the entrance of the parasite into the system. A person showing the symptoms described above should consult a reliable physician. No cure is effected until the head of the worm is destroyed.

TAPIOCA, *tap i o'ka*, a starch food prepared from the roots of the cassava, a plant found in the tropics. Tapioca is used chiefly in the preparation of a nutritious pudding; it is also used in thickening soups, as when boiled it swells and forms a jellylike mass. In preparing the substance for the market the roots are washed and ground to a pulp, and the mass is strained until the fibers are eliminated. The tapioca is then dried on hot iron plates, which causes the starch grains to form into small lumps.

TAPIR, *ta'pur*, a group of forest animals related to the hog. Of the five species, four are native to the western hemisphere. The common *South American tapir* is about the size of a small ass and has a brown skin, covered with short hair. It inhabits forests and lives much in the water. It conceals itself during the day and feeds on vegetables which it gathers with its flexible proboscis. Tapirs are hunted for their flesh and hides.



TAPIR

TAR, a thick, black, sticky product, obtained by the destructive distillation of such substances as wood, coal, peat and shale. (For the production of coal tar, see the article **COAL TAR**). Wood tar is made from pine, fir and larch trees. The crude stacking method is still extant in the Carolinas, Georgia and Alabama. Sticks of green pine are piled up in conical shape, and damp earth and sand are heaped over the wood to a depth of several inches. When everything is in readiness, the pile is ignited and allowed to burn slowly for about ten days. As the tar is melted out of the wood it is run into retorts, where it is distilled; wood spirit and pitch oils are given off. The black residuum is poured, while hot, into barrels, where it soon hardens and becomes the ordinary tar of commerce. As much as 150 barrels of tar are taken from a single "hole." The product is used for preserving timber, for calking seams in ships, in the making of roofs, and for other industrial purposes. It is also used in medicines and in ointments and skin lotions.

TARANTULA, *ta ran'tu la*, a large spider, named for Taranto, a city of Southern Italy, where it was first discovered and is still

found in great numbers. The name is now commonly applied to any large, hairy species in Southwestern United States and Central



TARANTULA

America. The tarantula captures its prey, not in a web, but by swiftly attacking it. It hides during the day in long, silken tubes in underground wells. The bite is very painful, but is no more dangerous than the sting of a wasp.

TARBELL, *tahr'bel*, **IDA MINERVA** (1857-), an American author who specializes in sociological and historical subjects, was born in Erie County, Pa. Shortly after her graduation from Allegheny College, she became associate editor of *The Chautauquan*, and later became identified with *McClure's* and the *American* magazines. Her works include a *Life of Abraham Lincoln* and several other biographies, but she is best known as the author of a *History of the Standard Oil Company*. Her keen observations on women are embodied in *The Business of Being a Woman* and *The Ways of Women*. Her only novel, *The Rising of the Tide*, has as its background the World War.

TARE, the common name of different species of the pea family, known also by the name of *vetch*. There are numerous species and varieties of tares, but that which is found best adapted for agricultural purposes is the common tare, which flourishes in poor soils, and of which there are two principal varieties, the *summer tare* and the *winter tare*. They are extensively cultivated throughout Europe for hay and as a fertilizer; one species is found in the United States. The tare mentioned in the Scriptures (*Matt. XIII, 36*) is supposed to be the darnel.

TARGET, *tahr'get*. 1, A shield, or buckler, of a small kind, such as those formerly in

use among the Highlanders, which were circular in form, cut out of ox hide, mounted on strong wood, and often covered externally with ornamental work. 2, The mark set up to be aimed at, in archery, musketry or artillery practice. These targets are generally square or oblong metal plates, on which is marked a central circle, with two or more wide rings around it. The marksman aims to put his shots as near the central point, or *bull's eye*, as possible; if he hits the bull's eye he is credited with five points; if he hits within the first circle, three points; within the second, one point. See ARCHERY.

TARGUM, *tahr'gum*, a term applied to a translation of parts of the Old Testament into the Chaldee, or Aramaic, language, originating probably when the Jews began to use Aramaic instead of Hebrew. Only three are extant on the Pentateuch, one on the Prophets; there are targums on *Psalms*, *Job*, *Song of Songs*, *Ruth*, *Lamentations*, *Esther* and *Ecclesiastes*. They are valued as studies of the lives of the peoples of those remote days.

TARIFF, in the common meaning of the term, *tariff* is the customs duties assessed on imported or exported goods, but in its broadest application it means any rate or charge. An example of the latter meaning is the tariff on railroads, which refers to the freight and passenger rates charged. The practice of levying customs duties on imports and exports was common to the nations of antiquity. Egypt, Assyria, Babylonia, all had systems of tariff. Later the same custom was practiced by the Greeks and Romans, by whom it was handed on to the nations of the Middle Ages, and nearly all nations of modern times have resorted to the tariff system.

Purposes of a Tariff. A tariff is levied for one or more of the following purposes:

1. To obtain revenue for the government.
2. To protect home industries.
3. To retaliate for unjust commercial treatment by some other nation. When resorted to for this purpose, tariff becomes commercial warfare.

A nation levying tariff for revenue only is called a *free trade* nation. England, for example, had been a free trade nation for more than half a century before the World War. A tariff designed to protect home industries is called a *protective tariff*. It affords protection to the industry upon whose products it is laid, by placing a tariff in

addition to that for revenue equal to the difference in the cost of manufacture of the article in a foreign country and the manufacture of the same article in the country where it is protected. If steel rails, for instance, can be manufactured in England and shipped to the United States at a price that will allow them to be sold for \$200 per ton, and it costs \$210 per ton to make them in the latter country, the American manufacturers of rails will be unable to compete with British manufacturers. To protect the American manufacturers, Congress may place a special tariff of \$10 a ton on the imported rails, which cannot then be sold for less than the domestic product.

A tariff for retaliation is seldom resorted to at the present time, but many commercial treaties contain *reciprocity* agreements, whereby each nation agrees to admit certain articles into its ports at a lower tariff than the regular schedule requires, provided, the other nation will admit certain articles into its ports on a similar basis. Fair reciprocity agreements are usually advantageous to both countries. In general, a revenue tariff is best for nations that have to import most of their raw material, and a large proportion of their foodstuffs. It was because of these conditions that England became a free trade nation. On the other hand, protection is usually considered the best policy for a new nation having abundant resources and desirous of building up extensive manufacturing interests. This policy also applies to older nations, having an abundance of raw material and extensive manufacturing interests. Before the World War all the leading European nations except Great Britain had protective tariffs.

In the United States. Prior to the adoption of the Constitution some of the individual states assessed a tax on imports, but there was no national tariff policy. Ever since the formation of the Federal government the United States has adhered generally to the policy of protection. The first tariff bill passed Congress in 1789, and from that time to the present the tariff has been one of the chief sources of political controversy. This bill had for its purposes the provision of revenue to support the government, paying the debts of the United States and for the "encouragement and protection of manufactures." The act was frequently amended, the duties always being raised, until 1824,

when a bill was passed providing an average rate of 37 per cent. Meanwhile the loose constructionists, under Clay, had declared for a protective tariff, in opposition to the strict constructionists, the forerunners of the modern Democrats, who claimed that the Constitution gave no power to levy anything but a revenue tariff.

The Tariff of Abominations. The result of the controversy between the strict and loose constructionists was the tariff of 1828, known as the "tariff of abominations," because it represented a decided advance towards protective duties. It was protested against by the Southern states, on the ground that it would lead foreign nations to discriminate against American raw materials, upon the export of which the South depended; also, because they believed it to be unconstitutional. In 1832 the South Carolina legislature declared the acts of 1824 and 1828 null and void, and prohibited the collection of duties.

Compromise of 1833. In the following year Henry Clay introduced a compromise tariff bill. The object of this bill, as expressed in its preamble, was "to prevent the destruction of the political system, to arrest civil war and to restore peace and tranquillity to the nation." It provided for a gradual reduction in duties. In response to firm action by Congress and by President Jackson, the nullification acts were repealed by South Carolina. From 1840 to 1845 several tariff bills were drafted and discussed, but only one, which provided for a rate of about 33 per cent, was passed. In 1846 the Walker tariff bill was passed, reducing the rate of duty to 25½ per cent. The tariff was further reduced until at the outbreak of the Civil War duties averaged about 20 per cent.

Civil War Period. With the outbreak of the Civil War, the policy of decreasing duties was abandoned. The Morrill tariff of 1861 raised the tariff to 27 per cent. During the next two years the tariff was raised several times on special articles; in 1864 all duties were raised by 50 per cent, and another increase was ordered in 1866.

Since the Civil War. A gradually growing discontent with the maintenance of the Morrill tariff, or so-called "war tariff," led, in 1882, to the appointment of a tariff commission to ascertain the effect of, and to recommend changes in, the existing tariff laws, but the resulting bill (1883) was satisfactory

to nobody. The Democrats came to power in 1884 and introduced, in 1888, the Mills bill, a measure intended to reduce taxation and simplify the collection of revenue, but it failed to become a law. The Republicans returned to power in 1888, and two years later they passed the McKinley bill, which generally raised the duties.

In 1894 the Democrats were in control and passed the Wilson-Gorman Tariff Act, which materially reduced the tariff, and became a law without the President's signature. This act was superseded by the Dingley Act in 1897, which again inaugurated a high tariff. In 1909 the Payne-Aldrich Act was passed at a special session of Congress. This act purported to lower the tariff, but it was not satisfactory to a great majority of the people, and resulted in the returning of a Democratic majority to the House of Representatives in the Sixty-second Congress. The bill provided for the appointment of an advisory tariff commission. In 1913 President Wilson called a special session of Congress to revise the tariff. The bill passed by this Congress, known as the Underwood-Simmons Tariff Act, provided for many changes in the rates. The duties on cotton goods and on woolen goods were greatly lowered and wool was placed on the free list. Sugar was to pay a slight duty until May 1, 1916; after that date it was to be free. Also on the free list were many chemicals and other articles. The Sixty-sixth Congress, which was under control of the Republicans, planned to place a protective duty on dyestuffs and numerous other articles whose manufacture had been developed after the outbreak of the World War, because these articles could not be obtained in Europe.

Related Articles. Consult the following titles for additional information:

Customs Duties	Protection
Economics	Nullification
Free Trade	Reciprocity
Political Parties	Tax

TARKINGTON, *tahr'king tun*, NEWTON BOOTH (1869-), a present-day American novelist, born in Indiana and educated at Princeton University. *The Gentleman from Indiana*, his first book, won immediate recognition, and each succeeding novel added fresh laurels. Some of his stories have been successfully dramatized, notably *Seventeen*, *Penrod* and *Monsieur Beaucaire*. A late novel, *The Magnificent Ambersons*, records the changes in American life that are taking place in the present generation. Tarkington's

The Man from Home, a comedy, was long popular on the American stage. In 1919 *Monsieur Beaucaire* was successfully produced in London as an opera.

TARPEIAN, *tahr pé'yan*, **ROCK**, a precipitous rock, forming part of the Capitoline Hill at Rome, over which persons convicted of treason were hurled. It was so named, according to tradition, from *Tarpeia*, a vestal virgin of Rome, the daughter of the governor of the citadel on the Capitoline, who, covetous of the golden bracelets worn by the Sabine soldiery, opened the gate to them, on the promise of receiving what they wore on their left arms. Once inside the gate they threw their shields upon her, and crushed her to death. She was buried at the base of the Tarpeian Rock.

TARPON, *tahr'pon*, a large game fish of giant strength, found on the southern coast of the United States and in the West Indies. The tarpon is shaped something like the salmon. It attains a length of five or six feet and a weight of from 100 to 400 pounds. Tarpon fishing is a favorite sport, for this fish is a skilful fighter. Its flesh is too coarse for food; but its large, tough, silvery scales are used in ornamental work.

TARQUINIUS, *tahr kwín'i us*, **LUCIUS**, surnamed *Priscus* (the elder), in Roman tradition, the fifth king of Rome. He became the favorite and confidant of the Roman king, Ancus Martius, and at the latter's death Tarquinius, although not of royal blood, was unanimously elected king. According to Livy, he made war with success on the Latins and Sabines, from whom he captured numerous towns. His reign was also distinguished by the construction of the Cloaca Maxima, the Forum and the wall about the city, and by the commencement of the Circus Maximus and the Capitoline temple. After a reign of about thirty-eight years (from 616 to 578 B. C.) he was killed by assassins employed by the sons of Ancus Martius (578 B. C.).

TARQUINIUS, **LUCIUS**, surnamed *Superbus* (the proud), the last of the legendary kings of Rome, the son of Tarquinius Priscus. He succeeded Servius Tullius, and reigned from 534 to 510 B. C. He abolished the privileges conferred on the plebeians; banished or put to death the senators whom he suspected; never filled up the vacancies in the senate, and rarely consulted that body. However, he continued the great works of his father and

advanced the power of Rome abroad by wars and alliances. After a reign of nearly twenty-five years, by his tyranny and cruelty he brought about an uprising by which he and his family were exiled from Rome (510 B. C.). He tried repeatedly, without success to regain his power, and at length he died at Cumae. In *Horatius at the Bridge* Macaulay has immortalized the attempt of Tarquinius to return to power. See **ROME**, **HISTORY OF**.

TARSHISH, *tahr'shish*, a place frequently mentioned in the Old Testament, now generally identified by Biblical critics with the Tartessus of the Greek and Roman writers. This was a district in Southern Spain, near the mouth of the Guadalquivir, settled by the Phoenicians.

TARSUS, *tahr'sus*, **ASIA MINOR**, the birthplace of the Apostle Paul and the most important town in ancient Cilicia, situated on both banks of the river Cydnus, about twelve miles from the sea. At the beginning of the Christian Era it was an important city, especially celebrated for its learning and educational institutions. Modern Tarsus is an unprogressive, unattractive city, with its only interesting features a few remains of the Roman occupation. Population, about 25,000.

TARTAN, *tahr'tan*, a cloth, checkered, or cross-barred, with threads of various colors. It was originally made of wool or silk and constituted the distinguishing badge of the Scottish Highland clans, each clan having its own peculiar pattern. An endless variety of fancy tartans is now manufactured, in wool, silk, wool and cotton, and silk and cotton. The pattern had its origin in Asia, and is probably the oldest pattern known.

TARTAR, or **ARGOL**, the hard crust adhering to the sides of casks in which wine has been incompletely fermented (see **CREAM OF TARTAR**). It varies in shade according to the color of the wine.

Tartar of the teeth, is a hard substance which occasionally is deposited from the saliva in the form of a coating upon the teeth, near the gums. It consists of animal matter, phosphate of lime and mucus from the saliva. See **TEETH**.

TARTAR, *tahr'tur*, **EMETIC**, a name given to the double tartrate of potassium and antimony, an important compound which is used largely in medicine. At first it is sweet to the taste, but the after taste in the mouth is very disagreeable. It is an active

emetic and cathartic, and it is of great value in reducing fever; but from its depressing influence on the heart, physicians are growing more careful in prescribing it.

TARTARIC ACID, a compound of carbon, hydrogen and oxygen, existing in grape juice, in tamarinds and in several other fruits. It is obtained in its commercial form principally from cream of tartar (which see).

Tartaric acid crystallizes in large rhombic prisms, transparent and colorless and very soluble in water. It is inodorous and very sour to the taste. The solution of tartaric acid acts with facility upon those metals which decompose water, as iron and zinc. Tartaric acid is largely employed as a discharge in calico printing and for making soda water powders and baking powders. It is valuable in medicine, for its cooling properties, and as an ingredient of Seidlitz powders.

TARTARS, or **TATARS**, a term loosely applied to certain roving tribes which formerly inhabited the steppes of Central Asia, but now referring to the Fishshin Tatars of Northern Manchuria, the Solons and Daurians of Northeastern Mongolia and the Manchus of China. The name has been indiscriminately applied from time to time to any Mongol invaders of Eastern Europe. *Tatar* is the more correct form. The true Tatars formed part of the horde of Genghis Khan and of the successive hordes of similar origin who followed them. See **GENGHIS KHAN**.

TARTARUS, *tahr'tur us*, in early Greek mythology, a deep and sunless abyss beneath Hades, where the rebel Titans were imprisoned by Jupiter. Poets after Homer referred to Tartarus as the place in which the spirits of the wicked received their due punishment. Sometimes the name was made synonymous with Hades.

TARTARY, *tahr'tur ry*, a name applied in the Middle Ages to the wide band of country extending through Central Asia, from the seas of Japan and Okhotsk, in the east, to the Caspian Sea, on the west, including Manchuria, Mongolia, Turkestan and all the south part of Russian Asia. It was inhabited by a fierce and warlike people known as Tartars (which see). In a restricted sense Tartary is identical with Turkestan.

TASHKENT', or **TASHKEND**, ASIATIC RUSSIA, one of the oldest and most important towns of Central Asia and the capital of the governor-generalship of Russian Turkestan. It is situated on a tributary of the Syr-Darya,

ninety miles northwest of Khokan, and consists of the native, or Asiatic, quarters and the Russian quarters, the latter being constructed on modern plans. The city contains numerous old mosques and temples, a bazaar and several colleges. The manufactures include silk, cotton and leather goods and metal articles. The city enjoys a considerable trade, and it transships merchandise received from Bokhara, Persia, Kashmir and India. Population, 1913, 271,900.

TASMANIA, one of the six states of the Australian Commonwealth, consisting of the island of Tasmania and a few adjoining islands. Tasmania is situated 150 miles south of the eastern extremity of Australia, from which it is separated by Bass Strait.

Topography. The island measures 200 miles from north to south and 245 miles from east to west. The interior consists of a central highland, or plateau, with an average elevation of from 3,000 to 4,000 feet, bearing along its western and northwestern borders a number of mountain ridges and peaks, of which the highest, Mount Cradle, is 5,070 feet in altitude. A number of isolated summits exceeding 4,000 feet are also found in various parts of the island. The plateau contains a number of lakes, the largest, Great Lake, being twelve miles long. All are noted for the beauty of their surroundings. The climate is delightful throughout most of the year. The rainfall varies in different parts of the island, being heaviest on the west and lightest on the east and southeast.

Resources. Tasmania is rich in copper ore, silver ore, tin and gold. The wealth of the state, however, lies chiefly in its copper mines. It also has considerable coal, which is mined to a limited extent. Large areas are covered with forests of valuable timber trees, and lumbering in some localities is an important industry. The soil and climate are very favorable for agriculture, and large crops of oats, wheat and hay are cultivated. Hops is grown with success, and the raising of fruit is becoming an important industry. Large numbers of cattle, hogs and sheep, too, are raised, and the annual wool clip usually exceeds 9,000,000 pounds. The island has about 650 miles of railway in operation, two-thirds of which belongs to the state. The main line connects Hobart, the capital, with the next most important port, Launceston, while numerous branch lines reach the interior.

Government. The government is similar to that of the other Australian states. The governor is appointed by the British crown and is assisted by a council. The legislative authority rests with a Legislative Council consisting of eighteen members and a House of Assembly called the Parliament of Tasmania.

History. Tasmania was discovered in 1642 by the navigator Abel Janszoon Tasman, and was named Van Diemen's Land, in honor of Anthony van Diemen, governor of the Dutch East Indies. In 1803 it was colonized by a company of convicts from England. For about twenty years the island was under the authority of New South Wales. In 1825 it was given a separate governor and continued as a colony of the British crown until the formation of the Commonwealth of Australia, when it became a member of that federation. Population, 1911, 191,211. See AUSTRALIA; HOBART.

TASMANIAN WOLF, a flesh-eating animal having the general appearance of a wolf, inhabiting the mountainous parts of the island of Tasmania. In size it is generally about four feet in length, though some specimens attain a much greater size. It has an elongated, and somewhat doglike, muzzle, and a long, tapering tail; the fur is grayish-brown, with a series of bold transverse stripes, nearly black in color, beginning behind the shoulders and ending at the tail. Because of this marking it is sometimes called the zebra wolf. It is nocturnal in its habits, is fierce and most determined in disposition and is very destructive to sheep and other animals. The Tasmanian wolves carry their young in a pouch, as do the kangaroos.

TAS'SO, TORQUATO (1544-1595), an Italian poet, son of Bernardo Tasso, born at Sorrento. He was early sent to the school of the Jesuits, at Naples, and he subsequently pursued his studies under his father's superintendance at Rome, Urbino and Venice. At the age of sixteen he was sent to the University of Padua to study law, but at this time, to the surprise of his friends, he produced the *Rinaldo*, an epic poem in twelve cantos. The reception given this poem induced Tasso to determine to devote his life to literature, and he went to Bologna, where he studied philosophy and worked on his great poem, *Jerusalem Delivered*. After some years spent in the service of Cardinal Luigi d'Este, he received an appointment at the court of

Alfonso, duke of Ferrara. Here he lived happily for years, produced his pastoral drama, *Aminta*, and completed the *Jerusalem Delivered* (1575).

About this time he became a prey to morbid fancies and believed that he was persistently calumniated at court and systematically misrepresented to the Inquisition. To such a pass, indeed, did this mania come, that the duke was obliged to have him placed in confinement. He escaped and fled from



TASSO

Ferrara, but again returned. So outrageous had his conduct now become, that he was seized by the duke's orders and confined as a madman. He remained in the asylum from 1579 to 1586, until he was released at the solicitation of Vincenzo Gonzaga. Broken in health and spirit, he retired to Mantua and then to Naples. Finally, in 1595, he proceeded to Rome, at the request of the pope, who desired him to be crowned with laurel in the capitol, but the poet died while the preparations for the ceremony were being made. Tasso wrote numerous poems, but his fame rests chiefly on his *Rime*, or lyrical poems, his *Aminta* and his *Jerusalem Delivered*.

TASTE. The sense of taste is located in the tongue and in the upper and back parts of the mouth. The special organs of taste are minute branches or filaments of the nerve of taste, or *gustatory* nerve. These filaments exist in three forms, they are threadlike, a form most numerous on the first two-thirds of the tongue; mushroomlike, found principally on the tip and sides of the tongue; and V-shaped; the latter are only ten or twelve in number and are located near the base of the tongue. The sense of taste is so closely related to the sense of smell that we cannot distinguish some articles by taste alone. Close the nostrils and blindfold a person and he cannot tell claret from vinegar, for instance; occasionally one cannot tell cold apple from cold potato. We can taste only those substances that are soluble. Glass has no taste, because we cannot dissolve it.

There are four sensations of taste—sweet, sour, bitter and salty, all other tastes or flavors are combinations of these. The pleasing effect of lemonade, for instance, is due to a combination of sugar, lemon juice, the odor of lemon and cold water. We often attribute other sensations to the sense of taste, especially that of temperature. We do not care for cold soup, and we prefer not to eat ice cream that has melted.

The larger the area covered by the substance, the keener the taste; therefore, when one wishes to experience the pleasure of an agreeable taste, he spreads the substance over as large an area as possible. On the contrary, when one wishes to escape the unpleasantness of a disagreeable taste, he swallows the substance as quickly as possible. The sense of taste is injured by overstimulation. Highly seasoned food and such articles as tobacco, wine, beer and alcoholic liquors tend to deaden the nerve filaments so that mild flavors produce little or no effect upon them, and a person so affected constantly demands more highly seasoned food to "tickle his palate." The sense of taste can be highly educated as is shown in the development made by buyers of butter, tea, wine and other articles of food. See SMELL; SENSES, SPECIAL; TONGUE.

TATARS. See TARTARS.

TATTOOING, the barbaric practice of pricking indelible patterns in the skin. While among some primitive peoples it is done merely for decorative purposes, for others it has a religious significance. Among some isolated peoples degrees of rank are indicated by tattooing. The skin is punctured with a steel, bone or steel point and some coloring matter is inserted in the wound. Sometimes several colors are used. Dark-skinned races employ a method of marking known as *scarification*; that is, gashing the skin and rubbing into it ashes or clay. This causes a light raised scar. Most sailors, even those of civilized countries, are tattooed on the back of the hand or on the forearm.

TAUNTON, *tahn'ton*, Mass., one of the county seats of Bristol County, thirty-six miles south of Boston, on the Taunton River and on the New York, New Haven & Hartford and several electric railways. It is essentially a city of homes, probably fifty per cent of the people having an equity in their own homes. This is brought about by coöperative banks and building and loan

associations. It contains a county law library and that of the Old Colony Historical Society. The public institutions also include Bristol Academy, Morton Hospital, an old ladies' home and one of the state insane asylums. The city hall, the county house, a Carnegie Library and a Federal building are the main public buildings. The city is the business center for a number of towns. The principal manufacturers are cotton goods, silverware, stoves and locomotives. The first successful iron works in America were established in Taunton, in 1853. Miss Elizabeth Pole found an Indian village here in 1637, called *Tecticut*, meaning Great River, and she purchased the land from the Indians for the first white man's settlement. It was called Cohannat, but was incorporated two years later under its present name. Robert Treat Paine, one of the signers of the Declaration of Independence, was a native of Taunton. It was made a shire town in 1746 and was chartered as a city in 1865. Population, 1910, 34,259; in 1917, 36,610 (Federal estimate).

TAURUS (the bull), the second sign of the zodiac, which the sun enters about April 20. The constellation Taurus contains about 140 stars. In the northern hemisphere it is overhead in December and January, and in the spring it gradually disappears over the western horizon. The largest star of the group is Aldebaran, a red star of the first magnitude. Clustered about it in triangular formation are six other stars, called the Hyades. These are imagined as representing the face of the bull, and the two bright stars above them, the horns; the group known as the Pleiades, six of which are visible to the unaided eye, mark the bull's shoulder. The symbol of Taurus is ♉ . See ASTRONOMY.

TAURUS, a mountain range in the southern part of Asia Minor. For the greater part of its course it follows the Mediterranean shore, and it forms the southern boundary of the great central plateau of Asia Minor. A branch of these mountains extending inland northeastward is known as the Anti-Taurus. Many of the Taurus peaks are more than 10,000 feet high.

TAUTOG, *taw'tog*. See BLACKFISH.

TAX, a contribution levied by legal authority upon private property or income to defray the expenses of government or for other public purposes.

A tax is said to be *direct* when it is demanded from the very persons who it is intended or desired should pay it, as, for example, a poll tax, a land or property tax, an income tax. It is said to be *indirect* when it is demanded from one person, in the expectation and intention that he shall indemnify himself at the expense of another; as, for example, the taxes called customs, which are imposed on certain classes of imported goods, and those called excise duties, which are imposed on home manufactures or inland production. A good illustration of a customs tax in America is a duty levied on tea and coffee. The importer pays the tax, but adds this amount to the original cost of the commodity and raises the price accordingly, so that in the end the tax is paid by the consumer. The tax on tobacco is an example of excise taxes.

In the United States and elsewhere, a tax on general property, both real and personal, forms the largest part of local revenues, municipal revenues being almost entirely raised from this source; while customs duties and excise duties furnish a large share of national revenue. Owing to the ease with which personal property may be concealed and the tax upon it avoided, the consequent inducement to perjury and the attendant injustice, many states of the Union have abolished it in part, substituting higher rates upon real estate, income, inheritances and certain kinds of traceable intangible property, such as franchises or mortgages. The poll tax has been abolished in over half of the states.

Principles of Taxation. Adam Smith laid down four principles of taxation, which have been generally accepted by political economists. These are: (1) The subjects of every state ought to contribute to the support of the government as nearly as possible in proportion to their respective abilities; (2) the tax ought to be certain, not arbitrary; (3) every tax ought to be levied at the time, or in the manner, most convenient for the contributor; (4) every tax ought to be so contrived as to take out and to keep out of the pockets of the people as little as possible over and above what it brings into the public treasury of the state.

Tax Sale and Title. If the owner of land fails to pay the taxes assessed on it within the time specified by law, the tax collector has authority to sell the land at public

auction for the taxes. The sale must be advertised and held strictly in accordance with the legal requirements, and it must be to the highest bidder, but in most states this means the bidder who will pay the taxes and cost of the sale. Time is given the owner to redeem his property, and the title granted the purchaser of the land does not become valid until this time has expired, when he is given a tax deed. The delinquent tax payer, in redeeming his land, must settle with the one who purchased it not with the tax collector.

Local Taxation. The state, county, township, school district, village and city are not allowed to raise money for expenses in any other way than by direct assessment of taxes upon the property of the people. The laws provide that all taxes levied shall be equitable—that is, that in any tax district each property owner shall pay in exactly the same proportion as any other who has taxable wealth.

There are a number of taxing bodies drawing funds from each neighborhood; so it is a little difficult to explain in a brief article exactly how taxes are levied, collected and distributed.

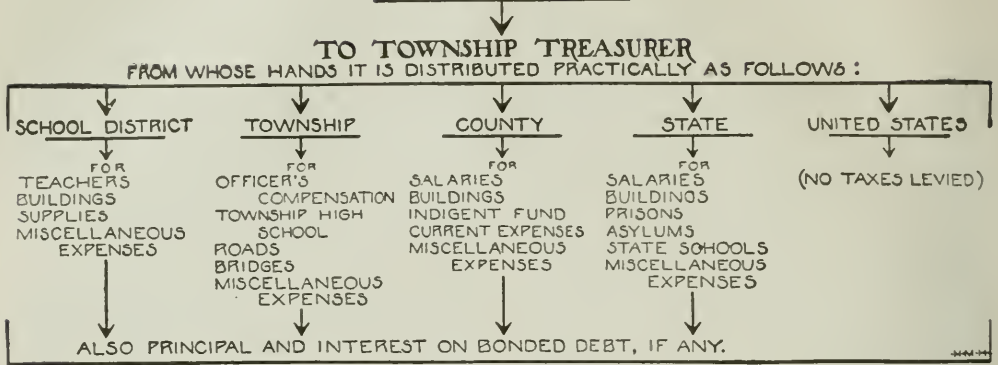
In outlining the general system let us begin with the demands of the state. The legislature appropriates money to a certain fixed amount for the state's annual expenses. The various counties of the state are told their exact proportion of this sum, and when the county assesses the property within its limits to defray county expenses it must add to this sum the proportion demanded by the state.

The county board of supervisors or county commissioners decide how much the county may have for expenses and each township is called upon to raise its portion. The people of the township must make appropriation for their own expenses; the school district at the annual meeting declares what its outlay for the ensuing year shall be, and makes assessments accordingly.

Mr. A. owns a farm on which his taxes are \$100. He finds he must pay something for the support of the schools, whether or not he has children, for the government of his township, his county and his state. This is all right and proper, for from each he receives benefits in return. The amount he pays is apportioned somewhat as follows, the details varying a little in different states:

Mr. A's Tax

\$100



In the above diagram the reader in Canada may substitute the words Province and Dominion.

If the taxpayer lives in an incorporated village or city his city or village tax is added to the other items, and he would pay his money to the city collector rather than to the township treasurer.

After all collections are made the various allotted proportions are sent to the proper authorities, to be spent according to the appropriations that have been made.

Related Articles. Consult the following titles for additional information:

Customs Duties	Inheritance Tax
Excise Tax	Poll Tax
Income Tax	Single Tax

TAXICAB, or, more properly, **TAXI-METER CAB**, a motor vehicle which is specially licensed to carry passengers for hire. It is equipped with an automatic device for registering milage or time consumed for each trip and indicating the amount of the fare. Taxicabs are in use in all large cities, and the service is regulated by city ordinances. Legislation with reference to rates, the number of passengers allowed according to seating capacity of the cab, breakdowns, time consumed in waiting for passengers, etc., protects both the company and the public. The "taxi" rates in Chicago are said to be the lowest in the United States. There one company charges twenty cents for the first half mile, and one may ride any number of additional quarter miles for five cents each. If the passenger is accompanied by another he pays only ten cents additional to his own fare for the entire trip.

TAXIDERMY, the difficult art of mounting the skins of animals so that they seem to

be lifelike copies of the live specimens. The expert taxidermist must understand natural history, drawing, sculpture, tanning, dyeing and several other branches to be able to do the work successfully; for the form over which the skin is placed after it is removed from the dead animal must be an exact reproduction (as to contour of the body) of the animal as it was in life. Therefore, in making a cast one must know as much about the animal's structure—its bones, muscles and flesh distribution—as the sculptor knows of human anatomy.

The first step in preparing a specimen is to remove the skin. This is done very carefully, to prevent any disfigurement or injury to the hide, hair, feather or scales, as the case may be. The cutting is so skilfully done that every part of the skin can be stripped, even to the ends of the toes. As soon as the skin is removed it is treated with arsenical soap. The preparation of the form on which the skin is to be mounted requires even more elaborate care. It necessitates in most cases the making of drawings of the animal and clay models before the final plaster or papier-mâché cast is made. When the skin is placed over the form it is put together in such a way as to conceal all the preceding steps in the process. The eyes of mounted specimens, formerly of glass, are to-day made of hollow globes, painted to give them a naturalistic expression.

Most of the expert taxidermists in America are trained in Rochester, N. Y., at a school of taxidermy founded by Professor

Henry A. Ward. The great natural history museums of Washington, New York, Pittsburgh, Milwaukee and Chicago contain some of the finest collections in the world, and the specimens of mounted deer, antelope, zebra, elk, caribou, moose and innumerable other animals are of unsurpassed workmanship. The amateur who is interested in preparing small specimens will find specific directions in taxidermists' guides and in government publications issued for free distribution.

TAY, the longest river in Scotland, and the largest, in volume, in the British Isles. It rises on the north side of the mountain known as Ben Lui, flows in a northeasterly direction through Loch Tay, then flows eastward, then southeastward, and finally enters the North Sea through the broad estuary known as the Firth of Tay. The entire length of the stream is about 120 miles. It is navigable for ocean vessels as far as Dundee and for smaller craft to Perth. Large towns on its banks are Dunkeld, Aberfeldy and Perth; its principal tributaries are the Almond, Earn and Bran and the Lyon, Isla and Tummel. The river is noted for its salmon fisheries and for the beauty of its scenery.

TAYLOR, BAYARD (1825-1878), an American writer and traveler, born at Kennett Square, Pa. He had a high-school education, then learned the printer's trade. At the age of twenty he visited Europe and tramped from place to place with a knapsack, supporting himself by contributing articles to home periodicals.

These letters were later published in a book form under the title *Views Afoot*. Subsequently he traveled in much the same manner in Asia Minor, China, India, Japan and Egypt and revisited Europe. *By-Ways of Europe, A Visit to India, A Journey to Central Africa, The Land of the Saracens, Travels in Greece and Russia, Egypt and Iceland and China and Japan* are descriptions of these travels.

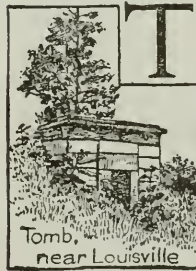


BAYARD TAYLOR

Taylor was secretary to the United States legation at Saint Petersburg (now Petro-

grad), at the time of the American Civil War, and in 1878 he became United States Minister to Germany, but died in Berlin shortly after receiving the appointment. In addition to those of his works already mentioned, some of the most notable are *El Dorado*, a description of California during the "gold fever;" *Hannah Thurston*, a novel and several volumes of poems, including *Lyrics and Songs, Lars, a Pastoral of Norway, The National Ode, A Book of Romances and Prince Deucalion*. By far his best work is a translation of Goethe's *Faust*, considered the best translation in the English language.

TAYLOR, JEREMY (1613-1667), a noted English author and divine, born at Cambridge and educated at Caius College. After taking holy orders he became chaplain to Charles I. and remained loyal to the king until the latter's execution. Afterwards he was a chaplain in the royalist army. With the Restoration came his appointment to the bishopric of Down and Connor, in Ireland, which he filled until his death. His works include *The Liberty of Prophesying, The Life of Christ, Holy Living and Holy Dying*, the last two considered the choicest classic of English devotion. Coleridge said, "Taylor is the most eloquent of divines; had I said, of men, Cicero would forgive me and Demosthenes nod assent."



TAYLOR, ZACHARY (1784-1850), a popular military leader whose achievements during forty years of army life, culminating in several brilliant victories in the Mexican War, made him President of the United States. He was fondly called "Old Rough and Ready;" for

his thoroughly-good service in the field against the Mexicans he had been awarded a gold medal by Congress, so with popularity almost unbounded, in 1848 he became a national political figure.

His Early Record. Taylor was born on September 24, 1784, in Orange County, Va. His father, Richard Taylor, had been a colonel in the Revolutionary War; soon after peace was declared he moved to a new settlement which is now Louisville, Kentucky. Zachary was then an infant, and he lived in Louisville until twenty-four years of age. In 1808 his older brother, a lieutenant in the

Administration of Zachary Taylor 1849-1850

- I. THE PRESIDENT
 - (1) Birth
 - (2) Ancestry
 - (3) Youth
 - (4) Military career
 - (5) Views on public questions
 - (6) Character
 - (7) Death
- II. THE COMPROMISE OF 1850
 - (1) Public sentiment
 - (a) In the North and South
 - (2) Terms of the Compromise
 - (a) California a free state
 - (b) Two territories organized without Wilmot Proviso
 - (c) Slave trade prohibited in District of Columbia
 - (d) Fugitive Slave Law
 - (3) Great speeches on the questions
 - (4) Immediate effects of the Compromise
 - (5) Ultimate results
- III. Other events of Taylor's administration
 - (1) The Nashville Convention
 - (2) President's opposition to spoils system
 - (3) Death of Calhoun, March 31, 1850
 - (4) Death of Taylor and inauguration of Fillmore

Questions on Taylor

When was Zachary Taylor born?
Who was his father? To what state did he move shortly after his son's birth?

Give a brief sketch of Taylor's military career.

What nickname was given him as a result of his methods of campaigning?

In a general way state the feelings of the country, North and South, with regard to the questions involved in the Compromise of 1850.

What were the terms of the Compromise?

What fugitive slave laws had been passed previous to the one of 1850?

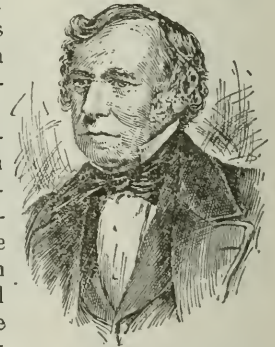
army, died; Zachary was given his commission, and thus was begun a long, honorable military career. Two years later he was promoted to a captaincy. His next promotion was to the rank of major, for clear-headed defense of Fort Harrison, in 1812, against a strong force of Indians, with fifty men, most of whom were ill of fever. Thereafter during the War of 1812 his activity was against the Indian allies of England.

After that war he did pioneer work in the northwest, building forts and guarding settlers against unfriendly Indians. He was stationed at Prairie du Chien in 1832, and earned the rank of colonel in the Black Hawk War, in the years immediately following. When that trouble subsided, Taylor was sent to Florida (1836) to conquer the Seminoles, which was accomplished by their defeat at Okeechobee. This campaign gained for him the rank of brigadier-general and the command of all the troops in Florida.

In 1840 he was transferred to the command of the Southwestern division, and Louisiana became the field of his activities. When trouble with Mexico became a possibility, Taylor was ordered to Corpus Christi, Tex. (1845), and soon was engaged in the most serious military work of his career. The story of his successes in the crises then upon him is told in detail in the article MEXICAN WAR.

The Presidency. Fresh from a victorious campaign, "Old Rough and Ready," though never having held a political office, was named by the Whigs for the Presidency in 1848. He was easily elected over General Lewis Cass and Martin Van Buren, opposing candidates.

When Taylor became President in 1849 he frankly admitted that he possessed few of the qualifications which make a successful executive. But he had been for forty years a leader of **ZACHARY TAYLOR** men; he was deeply conscious of his responsibilities, and he had rare good judgment. His choice of advisers was highly commended, and he became at once a deep student of the theory of government, deter-



mined to transform himself from a fighter into an executive, so far as might be possible at the age of sixty-five.

How well he would have succeeded is problematical; he made no serious mistakes during his first year, and his courage and steadiness were supporting qualities which were carrying him safely along. However, when his second year was fairly begun, he died, on July 9, 1850, after an illness of five days. The only great political movement of his brief administration was that connected with the Compromise of 1850 (which see).

His Family. The wife of Taylor was the daughter of a Maryland planter. His son, Richard became a general in the Confederate army in the Civil War, and his daughter Sarah married Jefferson Davis, who had been an officer under Taylor in the war with Mexico.

See illustration of the administrations of Taylor and Fillmore, page 1323.

TCHAD. See CHAD, LAKE.

TCHAIKOVSKY, *chi koi'ski*, PETER ILYITCH (1840-1893), the greatest musician Russia has produced, was born at Votkinsk, in the Ural region. He studied law and obtained a position in the Ministry of Justice, but his love for music turned him to a musician's career. Accordingly, he resigned his position and entered the conservatory that was under the direction of the great Rubinstein. In 1866 he became teacher of harmony at the Moscow Conservatory. He began composing, and wrote numerous compositions for the piano. At first his works were not appreciated, but, undaunted by criticism, Tchaikovsky kept on composing. His first concerto for the piano was played in Boston in 1875 by Hans von Bulow, on his first visit to America. Following this, his compositions covered a wide range, including symphonies, operas, overtures, songs and dances. Tchaikovsky was a man of culture and his works are of high order. Musical critics consider his "Overture Fantasie" to be his happiest work; the overture to *Romeo and Juliet*, *Manfred* and *Francesca da Rimini* represent him at his best. His operas are Russian, and his music is very popular throughout Russia. He was the master of orchestration, and his symphonies are favorites with great orchestra leaders.

TEA, the name applied to an oriental evergreen tree, to the leaves, a commercial article,

and to the highly-regarded beverage prepared from them. In its natural state the tree is widely branching and attains a height of thirty feet or more; under cultivation it is constantly pruned and kept at heights between two and six feet to increase the number of leaves. The leaves are dark green, shaped somewhat like those of the willow, and grow to be four inches long. The small, fragrant flowers are cream-colored and are shaped like a double rose.

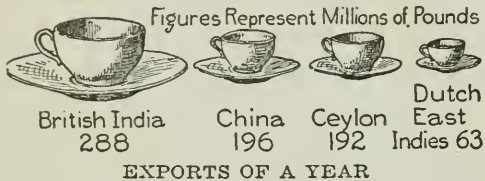
It is not known where the plant originated. The beverage was drunk by the Chinese as early as the sixth century. It was introduced into Europe in the seventeenth century. To-day the chief sources of supply are British India, China, Ceylon, Japan, Java and Formosa, which, collectively export 750,000,000 pounds a year. In India, Java and Ceylon tea is grown on large plantations several hundred acres in extent; in the other tea-growing countries it is cultivated on small pieces of ground and in gardens.

The plants are grown from seeds under cover, and when four or five inches high are set out in rows, there being about 1,500 plants to an acre. The plants are commercially profitable when three years old and reach full productivity at the age of five years. The crop is gathered three times a year, the second harvest yielding tea of the finest quality. The leaves are picked mostly by women and girls. They are then dried and withered and afterwards fired.

Different grades of tea are prepared from leaves of the same plant. They are all divided into two classes—green teas and black teas.

To prepare what is commercially known as green tea, the leaves are roasted almost immediately after they are picked, rolled by hand to crack the veins and set the acids, and are then dried quickly to preserve the color. Black teas go through a longer process of drying and roasting, and this causes them to turn black. The cheaper grades of green tea are often colored with Prussian blue, powdered talc or some other coloring substance. In India and Ceylon the leaves are machine-rolled (the more delicate leaves of the Chinese teas are not successfully prepared by machine-rolling, but are treated by hand). After the leaves are roasted, cutting machines break up the rolled leaves into small pieces. The leaves are then sifted and packed for shipment.

The chief consumer of tea is England, which uses almost twice as much as any other country. In 1918, over 84,000,000 pounds were produced for the British army alone, not including the troops in India. Other tea-drinking countries are Japan, the United States, Russia and Canada. Practically all the tea for the British market is supplied by India. Although Chinese tea is of superior delicacy and flavor, the Chinese tea trade has



steadily declined, owing to British enterprise and competition in India. In 1917 China's tea exports were only 150,000,000 pounds, the lowest on record since the trade became established. Much of its American tea trade has been diverted to the British and Dutch East Indies, which, in 1918, supplied the United States with half of its tea, the total import for the year being 151,315,000 pounds—the largest known for that country. The quantity of tea consumed is increasing rapidly. The extensive prohibition of the manufacture and sale of intoxicating liquors in the United States has resulted in an appreciable expansion of the tea trade. In fact, the reduced consumption of alcoholic beverages in many countries is so increasing the consumption of tea that the world's demand will exceed the possible supply for some years to come.

TEACHERS' INSTITUTE, a meeting of teachers held for the purpose of giving instruction in devices and methods of teaching. The institutes are usually held during the summer months and continue for one or two weeks. The county is the unit for the institute, which is usually in charge of the county superintendent. Educators of experience are employed as instructors. In some states attendance upon the institute adds to the teacher's standing in her examination for a certificate.

TEAK, *teek*, a tree of the verbena family, found in Southeastern Asia and adjacent islands. It grows to an immense size and is remarkable for its large leaves, which are from twelve to twenty-four inches long and from six to eighteen inches broad. The wood, though porous, is strong and durable; it is

easily seasoned and shrinks but little. It contains a resinous oil, which enables it to resist the action of water and to repel the attacks of insects of all kinds. It is extensively used in shipbuilding, furniture making and for many other purposes. Mahogany is perhaps the only more valuable wood.

TEASEL, *te'z'l*, a thistlelike plant with long, stemless leaves, prickly stems and sharp bracts surrounding the flower heads. The seed vessels are covered with strong, sharp spines that are slightly curved at the point. The heads, which are used for raising the nap on cloth, are cut in two and attached to a cylinder which is made to revolve against the cloth. The large heads are used for the nap on blankets, the next in size for cloth for men's clothing, and the smallest size for broadcloth and fine woolens. No mechanical device has been invented which takes the place of this plant. The teasel is native in Southern Europe and is widely cultivated.

TEBRIZ, *ta breez'*. See **TABRIZ**.

TECHNICAL AND INDUSTRIAL EDUCATION. See **VOCATIONAL EDUCATION**.

TECK, *tek*, ALEXANDER AUGUSTUS FREDERICK, PRINCE OF (1874-), an English army officer, brother of Queen Mary. In 1914 he was announced as the new Governor-General of Canada, to succeed the Duke of Connaught, but at the outbreak of the World War he was ordered to the front, where he was promoted to the rank of colonel for bravery in action. He married in 1904 Princess Alice of Albany, granddaughter of Queen Victoria. His Highness was educated at Eton and Sandhurst. He served in the Matabeleland campaign of 1896 and in the South African War in 1899 and 1900, when for valiant services he won the Queen's medal and was honored with the Distinguished Service Order.

TECUM'SEH, or **TECUMTHA** (1768-1813), a celebrated Shawnee Indian chief. In 1805 he began to formulate his plans for organizing the Indians of the West into a confederation, and about 1811 he had collected a large force on the Wabash River. The defeat of his brother by General Harrison, at Tippecanoe, disturbed his plans, and he went to Canada at the outbreak of the War of 1812 to aid the British. He was killed in the Battle of the Thames River.

TE DEUM, a famous Latin hymn, named from its opening sentence *Te Deum Laudamus* (We praise Thee, O Lord). It is one



1a

2a

3a

2a

3a

1A Tea Plant
2A Seed
3A Fruit (upper side)

TEA AND COFFEE



1b

3b

2b

4b

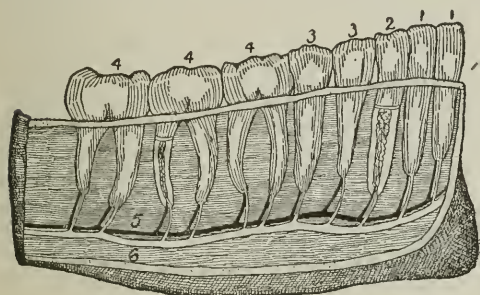
5b

1B Coffee Plant
2B Ripe Berries (Porto Rico)
3B Ripe Berries with pod removed

4B Fruit (cut to show the berries)
5B Flower (longitudinal section)

of the most solemn and majestic hymns ever written. The authorship is unknown, but the majesty of its words has inspired many of the great composers to exercise their genius upon it. The *Te Deum* is usually sung in the Roman Catholic churches on occasions of rejoicing and thanksgiving.

TEETH, the hard, bony appendages which are fastened to the jaw in most vertebrates, and assist in mastication. In man and the higher mammals two sets of teeth are developed, the temporary, milk or deciduous teeth, and the permanent set. In fishes the



TEETH

1, incisors; 2, canine; 3, bicuspids; 4, molars (the molar at left is the "wisdom" tooth); 5, a blood vessel; 6, a nerve.

teeth fall off and are renewed repeatedly. In man the teeth are imbedded in sockets in the upper and lower jawbones. There are thirty-two in all, sixteen in each jaw. The four central teeth, or *incisors*, have chisel-shaped crowns, with sharp edges; on each side of these four is a pointed *canine* tooth, which in the upper jaw is called an eye-tooth; on each side of these two are *bicuspids*; then come the *molars*, three on each side. The last of these molars, owing to their arrival between the seventeenth and twenty-fifth years, are called *wisdom teeth*.

Each tooth has a crown, the visible part, and a root or fang, the hidden part. The central cavity is filled with a soft pulp, containing blood-vessels and nerves. Dentine, a hard substance, composed of phosphate and carbonate of lime, makes up the greater part of the tooth. The outer covering of the fang, called *cementum*, is a substance resembling bone, while the covering of the crown is a hard enamel. In young teeth the enamel is covered by a delicate membrane, called the "skin of the teeth," which is worn off in adult life. If the enamel which covers the tooth becomes cracked or broken, the underlying dentine is exposed and soon

breaks down; and when the decay reaches the pulp which contains the blood-vessels and nerves, toothache results.

By constant and regular care of the teeth, much pain and suffering may be avoided. After every meal the teeth should be cleaned with a brush and plenty of pure water. Some simple tooth wash or powder, which contains no injurious substances should be used. Children should be taught to clean their teeth every day, at least, so as to avoid decay and to preserve the general health, which is often injured by unhealthy conditions of the teeth and gums. A dentist should examine a person's teeth at least once a year, that he may repair any decay before it becomes serious. See DENTISTRY.

TEGNER, *teg nair'*, ESAIAS (1782-1846), a Swedish poet. He studied at the University of Lund, became professor of Greek literature there and later was appointed bishop of Wexio, where he died. Among his works the most important in his *Frithjof's Saga*, an epic poem, repeatedly translated into English. Longfellow translated it, as he did also *The Children of the Lord's Supper*.

TEGUCIGALPA, *tay goo se gah' pah*, CENTRAL AMERICA, the capital and largest city of the republic of Honduras, on the Choluteca River, about seventy-eight miles from its mouth. It is in an important agricultural region, and the mineral resources of the surrounding country, while not as great as formerly, are still considerable. Its most imposing buildings are its cathedral, a national university and a seminary. Population, 1914, 28,950.

TEHERAN, *teh rahn'*, PERSIA, the metropolis and capital of the country, situated seventy miles south of the Caspian Sea, on an elevated plateau about 4,000 feet above the sea. The city is near the snow-covered Elburz Mountains, and is enclosed by a wall which has twelve gates. The town is poorly built, and most of the dwellings are low mud structures. There are numerous mosques and bazaars. The newer part of the city has modern boulevards lighted by gas, and it is traversed by street railways. These present a marked contrast to the filthy, narrow streets of the older portion. The region is made productive by water drawn from the mountains through underground canals. The important buildings are the royal palace, the government buildings connected with it, and the royal museum, housing jewels of great

value. The population in winter is about 280,000. In summer, many of the inhabitants remove to a more healthful location.

TEHUANTEPEC, *ta wahn ta pek'*, ISTHMUS OF, the narrowest part of Mexico and the narrowest part of North America, north of Costa Rica, lies between the Gulf of Campeche, an arm of the Gulf of Mexico, west of Yucatan, and the Gulf of Tehuantepec, on the Pacific. It is 120 miles wide at its narrowest point, where a valley between the mountains reduces the altitude to less than 1,000 feet. In 1907 a railway was completed across the isthmus from Coatzacoalcos, on the Atlantic, to Salina Cruz, on the Pacific. The line is 150 miles long and is operated jointly by the English construction company and the Mexican government.

The narrowness of the isthmus made it of interest to the world's mercantile interests at an early day, and the feasibility of an interoceanic canal to cross it was discussed for a century. Later another route farther north, at a wider point, was deemed more desirable, because Lake Nicaragua and a river system could be utilized. For particulars of this discussion and efforts growing out of it, see NICARAGUA CANAL. All of these projects were finally rejected in favor of a lock-system canal at Panama.

TELAUTOGRAPH, *tel aw' toh graf*, an instrument for transmitting writing by means of electricity, invented by Professor Elisha Gray. It consists of a transmitter and a receiver connected by wires. The transmitting apparatus is contained in a metal box intended to rest on a desk or table. The writing is done on a sheet on top of this, with a metal stylus which in appearance resembles a lead pencil. To a groove near the point of this stylus are attached, one on each side, two silk threads, which are connected with the transmitting wires and which convey the movement of the stylus to them. The receiver is held in an upright metal frame with the sheet exposed on one of its broad, flat sides. On this the writing is recorded by means of a pen connected with the receiving wires, and a *facsimile* of the writing is instantaneously reproduced. This little device is extensively employed in department stores, government offices and clubs to transmit instructions from one department to another. It is invaluable in banks as a means of transmitting signatures at a distance.



TELEGRAPH, *tel'e graf*. "What hath God wrought?" Little did Annie Ellsworth, the author of that first telegraph message given to the world, realize the fullness of its meaning, in connection with the wonderful device used in its transmission from Washington to Baltimore in 1844. To-day there are in the United States more

than 1,814,000 miles of telegraph lines. These lines are served by over 31,000 offices and carry over 103,000,000 messages a year. Canada has about 54,000 miles of wire, over which over 12,000,000 messages are sent yearly. The combined telegraph systems of the world include over 5,875,000 miles of wire, or enough wire to extend 231 times around the earth. In addition to the lines on land, there are over 236,300 miles of telegraph cables, binding together the continents and linking the islands of the sea to centers of civilization.

So far as communication is concerned, the telegraph has done away with distance, for a signal can be sent around the earth in less than a minute or across a continent in the winking of an eye. The telegraph has made distant nations neighbors, and has extended the influences of civilization to the remotest parts of the earth. Our morning paper contains the news of the world, and within an hour or less from the time an important event occurs in Europe, Asia, Africa, Australia or the Philippines, news of it is in the office of every important newspaper of the world, because there is a telegraph station within easy reach of the place where the event occurred.

In its broadest meaning, the term *telegraph*, which means *to write far off*, includes all devices for communicating by signals that represent words; however, since the electro-magnetic telegraph has practically displaced all other devices, the meaning of the term is now restricted to that device.

Electro-Magnetic Telegraph. The electro-magnetic telegraph consists of the following essential parts: (1) a battery or other source for generating an electric current; (2) a line wire or other conductor for conveying the current from one station to another; (3) an

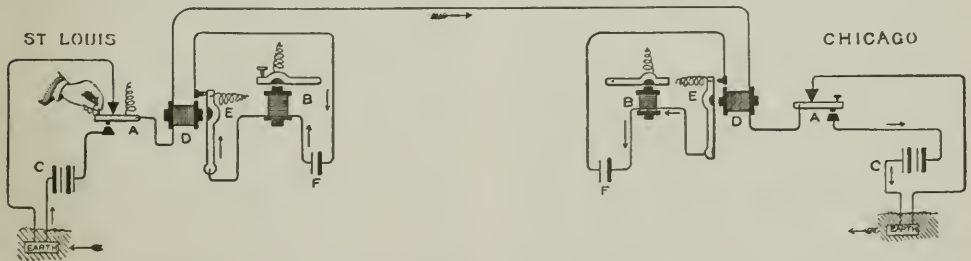
apparatus for transmitting the message, and (4) an apparatus for receiving the message. The line wire usually consists of iron wire, which has been galvanized to protect it from the weather, and it is supported upon poles from twelve to twenty feet in height, being attached to them by glass or porcelain insulators. Theoretically there should be two wires, in order to complete the circuit, but in practice the earth is made to take the place of one of these, by attaching the wire leading from one pole of the battery to an iron plate buried in the ground or to the rails of a railway track.

The transmitting apparatus consists of a lever, placed on a pivot; it has a knob on the upper side of one end, and immediately under this is a wire containing a platinum point, which, when the lever is pressed down, meets another similar point on the table, connected with the opposite pole of the battery. The receiving apparatus consists of a core of soft iron, wound with a coil of insulated wire, thus making an electro-magnet; and above this is an armature, which is attached to a lever that has an upward and downward motion.

The principle upon which the telegraph operates is that of the making and unmaking of an electro-magnet, by the passage and interruption of the current. The diagram shows the various parts of a telegraph, in

so that the lever strikes upon a metallic point with a sharp click. As long as the key at Saint Louis remains closed, the lever on the sounder in Chicago will remain attached to the magnet, but the instant the transmitting key is opened, the circuit is broken, and the spring in the sounder *B* brings this lever back into its former position. Thus the vibrations produced by the operator at Saint Louis are exactly reproduced in the sounder at Chicago, and the operator at that station reads the message by the sounds produced in his instrument.

In nearly all telegraph stations there is an additional apparatus, known as the *relay*. This is represented by *D* in each station. The relay is simply an electro-magnet of greater power than that used in an ordinary sounder. This magnet is connected with the local battery and is used along the line when the distance is so great that the current from the ordinary working battery is not strong enough to carry the message successfully from one station to the other. The relay is connected with the local battery, and in case of transmitting the message from Saint Louis to Chicago, by means of the relay, a weaker line battery can be successfully used. The current passing through the relay at *D* attracts the lever *E* in the same manner that the lever of the sounder is attracted.



such relative position as to indicate the equipment of two stations. In each station *A* represents the transmitting lever, known as the *key*; *B*, the receiving apparatus, or *sounder*, and *C*, the battery. When the operator in Saint Louis wishes to transmit a message to Chicago, he presses down the key, which is ordinarily held up by the spring. As the platinum point on this key connects with the metallic point beneath it, it closes the circuit and sends a current over the line wire to the station in Chicago. This magnetizes the electro-magnet in *B* at that station and causes it to bring down the armature above,

This makes a connection between the line battery *C* and the local battery *F*, which is also connected with the sounder, and when the relay is used the sounder has the benefit of the current from the local battery and is thus easily operated, while without this aid it would fail to respond to the movements of the transmitting key at a distant station.

Rapid Telegraphy. In large cities and on lines having a great amount of business messages cannot be transmitted with sufficient rapidity by this apparatus, hence devices for rapid telegraphy have been invented. The device in most common use consists of a

transmitting and receiving apparatus constructed on a similar plan and moving with the same rate of speed. The message is prepared on a paper tape, by a machine containing keys similar to those on the typewriter. The dots punched out on this paper correspond to those in the telegraph alphabet. The transmitting machine contains an electric brush, which comes in contact with the rim of a steel wheel. The paper forms an insulator between the brush and wheel, except where the dots appear. As this tape is run over the wheel, the dots complete the circuit, which is indicated in the receiving apparatus by a steel point, which passes over a similar tape, chemically prepared, so that whenever the electric current passes through it a bluish-black dot or dash will be made. Thus the message is reproduced in the telegraph alphabet. By means of this apparatus many times the number of words can be transmitted in a given time that would be possible by the ordinary operating key.

Multiplex Telegraph. In 1872 Thomas A. Edison invented a device for sending two messages in opposite directions over the same wire at the same time. Since that time this invention has been perfected and extended, so that four or more messages are readily sent at once over the same line. In 1919 further improvements of the multiplex system made it practicable to use the same wire for both telegraph and telephone purposes at the same time. Five telephone conversations or five telegraph messages can be transmitted simultaneously, or the wires can be used for both telephone and telegraph messages at the same time.

Printing Telegraph. The "stock ticker" seen in brokers offices and banks is a printing telegraph which writes its messages on a tape. It is used for sending quotations from the stock exchanges to their patrons. The printing telegraph operates on very much the same principle, and delivers the message in printed or typewritten form. The operator sends the message by operating a typewriter keyboard as though he were writing a letter. In some forms a specially devised typewriter receives the message. Each key in the receiving typewriter has a small electro-magnet attached to it. Each of these magnets responds to the electric impulse of the corresponding key on the sending machine and to no other, so that the letters struck by the operator are reproduced

on the receiving machine. The operator does not need to know the Morse code.

Boys' Telegraph. Crude telegraph instruments can be made by any boy who is acquainted with the fundamental principles of electricity, but they are seldom satisfactory. Many firms have on sale inexpensive sets of telegraph instruments, with full directions for installing an amateur telegraph line, and boys interested in learning telegraphy by themselves are advised to consult these dealers.

History. Several attempts were made to invent a telegraph previous to 1831, but none was successful. In that year Prof. Joseph Henry discovered that a piece of soft iron could be instantly magnetized by passing an electric current through a coil of wire surrounding it; also that it could be as quickly demagnetized by breaking the circuit. The following year Prof. Samuel F. B. Morse conceived the idea of making use of this principle as a means of communication, and while on the return voyage from Europe he made the drawings and perfected the plan for the necessary apparatus. Professor Morse gave his first exhibition of this apparatus in 1837. Three years later a patent was obtained, and the inventor applied to Congress for an appropriation to construct a telegraph line from Washington to Baltimore. The majority of Congressmen did not believe that Morse's idea was practicable, and it was not until some years later that the desired appropriation was secured. The first telegraph line was completed in May, 1844, and its success far exceeded the expectations even of the inventor. In the perfection of his apparatus Professor Morse was assisted by Professor Henry and Mr. Alfred Vail, a skilled mechanic.

The system of signals known as the Morse Alphabet then adopted has remained in use. It consists of a series of dots and dashes which represent the letters and figures in ordinary use. The first instrument used a receiver which recorded the message on a paper tape that passed over a cylinder, down upon which a pencil point was brought when the circuit was closed; but operators soon discovered that they could read more rapidly and accurately by the ear than by the eye, and this form of receiving apparatus was replaced by the *sounder*, now in almost universal use. The tape receiver is still retained

for recording stock quotations and those from other market reports and for a few other special purposes. The additions to Morse's invention have been for the purpose of extending its usefulness and have not in any way modified the principle upon which his plan was based. The electric telegraph is now in use throughout the civilized world, and ocean cables have been laid to such an extent that it is possible to communicate with almost any part of the world within the space of a few minutes.

Related Articles. Consult the following titles for additional information:

Cable, Submarine	Morse, Samuel F. B.
Edison, Thomas A.	Telautograph
Electro-Magnet	Telegraph, Wireless
Electro-Magnetism	Telephone

TELEGRAPH, WIRELESS. The chief difference between the line, or wire, telegraph and the wireless telegraph is that in the latter the overhead wire or submarine cable is omitted. The apparatus for each is much the same in its construction and operates on the same principle. In wireless telegraphy, the transmission is by wave propulsion in the air; in line telegraphy, it is through the overhead wire. If a pebble is thrown into a pool of still water, ripples will extend in ever-widening circles from the point of contact to the shore or until the force of the impulse is exhausted. When a bell is struck the impulsion which conveys the sound radiates from the bell in all directions, and, if there were no obstructing bodies the bell would occupy the center of an ever-enlarging sphere, on the surface of which the sound would become fainter as the sphere grew larger.

The electric impulses set up by opening and closing the circuit are transmitted through the air, in the same manner as those set up by

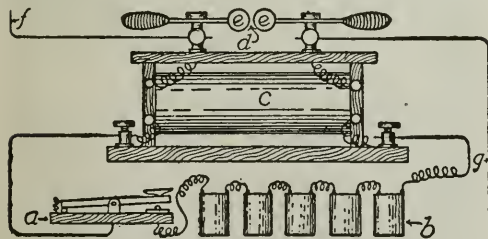


FIG. 1.

ringing the bell. The instruments necessary in wireless telegraphy are a transmitter, an aerial apparatus and a receiver.

The Transmitter. The transmitter (Fig. 1) consists of the key, *a*; the battery, *b*; the in-

duction coil, *c*; and the spark gap, *d*, which consists of two sliding rods on which are mounted the balls, *ee*. One of these rods is connected with the aerial by the wire *f*, and the other with the ground by the wire *g*. It requires a stronger current to set up impulses that will traverse the air than is needed in the line telegraph, so the key is connected with an induction coil to which the spark-breaker is attached. The impulses are produced by the spark-breaker, and the size of the spark is regulated by the space between the balls, *ee*. Stronger sparks are required for long than for short distances.

The Receiver. The receiving outfit (Fig. 2) is more complex than that required in line telegraphy, and consists of the following

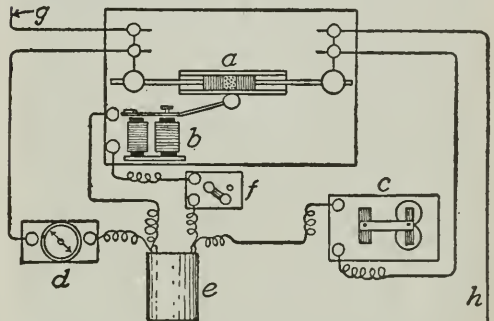


FIG. 2.

parts: the detector, or coherer, *a*; the de-coherers, *b*; the telegraph sounder, *c*; the galvanometer, *d*; the battery, *e*, and the de-coherer switch, *f*. The coherer is connected with the aerial by the wire, *g*, and with the ground by the wire, *h*.

The Aerial. The aerial consists of one or more wires suspended in the air, usually on tall supports on the tops of buildings and insulated by being attached to their supports with glass or porcelain fixtures. The aerial may consist of a number of parallel horizontal wires. A leading-in wire connects the aerial with the receiver. The horizontal aerial is the most common form, but aerials consisting of a large number of vertical wires are used on high towers. The greater the height of the aerial, the greater the distance over which the message may be sent. The aerial furnishes a large conducting surface, from which the impulses go out in sending and by which they are caught in receiving.

Sending the Message. A much stronger current is necessary for sending impulses through the air than for sending them over a

wire, and the induction coil is for the purpose of reinforcing the current provided by the battery. The impulses are set up by the spark-gap, and the strength of the spark is regulated by the current and the distance between the balls, *ee*. When the operator presses down the key the current is sent through the induction coil and causes a spark; the impulse thus created passes over the aerial wire to the aerial, from which it passes into the air. The regular telegraph codes are used, and at the receiving station the impulses are made to operate the ordinary telegraph sounder or receiver. The wireless operator uses his key as he would were he sending the message over a wire.

Receiving the Message. The impulses caught by the aerial at the receiving station are too weak to operate the most delicate telegraph sounder, and the most ingenious device connected with the receiving outfit is the *coherer*, or *detector*, of which there are several patterns. The coherer is a device for detecting very delicate electric currents. The pattern in general use consists of a small glass tube fitted with two metal plugs, preferably of silver. The space between the plugs is filled with fine filings of nickel and silver. Wires lead from the plugs, one being connected with the aerial wire and the other with the ground wire. Other wires join the coherer to a local battery and to the sounder. When an electric current passes through the coherer, the filings cling together and a current from the local battery flows through the coherer to the sounder, which it operates. The decoherer consists of a vibrator, which instantly jars the filings in the coherer so that the current from the battery is weakened between impulses. The operator uses ear receivers similar to those used by operators in a telephone exchange, for some of the signals are scarcely audible.

Tuning. The fact that the same message could be received by any number of stations within reach of the transmitter seemed at first to deprive wireless telegraphy of that secrecy necessary to the transaction of business, and to render it valueless for commercial or government purposes. This objection was overcome by a system of tuning, which consists in adjusting the transmitter of one station and the receiver of another to impulses of a certain length. The length of the impulses is determined by the spark, and by increasing or decreasing the size of

the spark coil (induction coil) this length is easily varied. Each receiving station has its apparatus gauged to respond to impulses of a certain length, and it will not respond to any others. An operator in Detroit, for instance, wishing to send a message to a given station in Cleveland, adjusts his transmitter to the receiver of that station, and the message is as closely safeguarded as though it were sent over a wire.

Uses. Wireless telegraphy now competes with line telegraphy in practically all lines of telegraphic communication, and it is used for numerous purposes where line telegraphy cannot be employed, as in sending messages from ships at sea and on the Great Lakes. All passenger ships and many freight ships are equipped with wireless apparatus. In the World War airplanes equipped with wireless directed the movements of the armies in battle and they were also of great assistance in directing artillery fire. The first airplane to cross the Atlantic, in charge of Lieut. Commander C. A. Read of the United States navy, in May, 1919, was in constant communication with ships stationed along the route. The system is also in successful operation on railway trains.

The first wireless stations could send messages only a few miles, but as the apparatus was improved, the distance was increased until now the standard station has a range of 1,000 to 1,500 miles. In 1901 Marconi sent the first message across the Atlantic. Since then the United States government has constructed wireless stations for sending messages for great distances and communicating with warships at sea. That at Arlington, across the Potomac from Washington, is one of the most powerful in the world; it has communicated with Hawaii. Messages from Alaska have been picked up at Key West, Fla. The great German station at Nauzen sent powerful impulses during the World War that were picked up 12,000 miles away.

Amateur Stations. Wireless telegraphy is so simple that many boys have installed apparatus of their own make, and found it to work successfully for distances ranging from four to fifteen miles. When war was declared with Germany, the American government ordered all private stations dismantled, because of the possibility they afforded of giving information to the enemy, and 200 stations were found in Chicago alone. At that rate there must have been more than 3,000

of them in the country. While most of them served no other purpose than that of amusing their owners, doubtless some of them were used for practical purposes.

History. The first step leading towards wireless telegraphy was the discovery of electric waves in the ether by the German physicist Hertz, in 1888. Light waves and electric waves are alike, except that the electric waves are longer. The sun sends electric waves to the earth, but we are unable to perceive them. Nevertheless, it was known for more than a century that electric currents could be transmitted through space by the atmosphere before any attempt was made to turn this knowledge to practical use. The coherer described above was invented in 1890, and in 1894 Marconi began his experiments which made wireless telegraphy practical.

Related Articles: Consult the following titles for additional information:

Electricity	Telephone
Marconi, Guglielmo	Telephone, Wireless
Telegraph	

TELEMACHUS, *te lem'a kus*. See ULYSSES.

TELEPATHY, *te lep'a thi*, a term used to denote the influencing of one mind by another, without the use of ordinary means of communication. It is closely related to clairvoyance (which see). Some persons seem to have the power of communicating to others, at a distance, what is happening to them, "often without any intention or consciousness of doing so on their own part." Occasional incidents of this sort, a knowledge of the fact that the mind is aroused to activity by intuition as well as by impressions received through the senses, and belief in clairvoyance, have led some people to believe in telepathy as an established fact.

Most careful investigations by the Society for Psychical Research led the investigators to the conclusion that in most instances there was a means of communication between the parties which the observer could not detect. For instance, when A and B are in the same room, the experiment succeeds more frequently than when they are in separate rooms. If A wills that B write the number 10, B must have this number in his mind as A wills him to write it. When A and B are in the same room the number willed is written correctly more times than can be accounted for by chance, but when they are in separate rooms the experiment does not succeed more frequently than it would by chance.

The evidence in favor of telepathy is not yet sufficient to warrant acceptance of the theory, although it has some ardent supporters. See SUPERSTITION, and list of related articles.



TELEPHONE, *tel'e fone*.

The word *telephone* means to talk far off, and the term is applied to all devices by which the sound of the human voice is carried to a distance. The simplest telephone consists of two vibrating membranes, connected by a cord passing through small openings in the respective centers. Such a telephone is easily made with two tin fruit cans. Punch a small hole in the center of one end of each can, the other end being removed; join them by a twine, held in place in each can by a large knot, and draw the cord taut. Conversation can be carried on through this instrument at a distance of several hundred feet, and disks of membrane specially mounted for this purpose and joined by copper wire will work successfully for a mile or more.

The Electric Telephone. The electric telephone was invented by Alexander Graham Bell and was first exhibited to the public in 1876 at the Philadelphia Centennial Exposition. The essential parts are the transmitter and the receiver. The transmitter

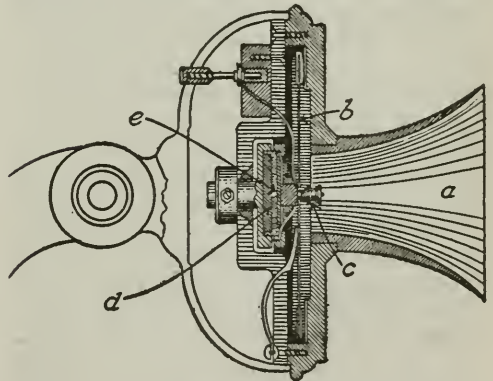


FIG. 1.

(Fig. 1). consists of a funnel-shaped mouth-piece, directly back of which is a metal disk. A button of hard carbon is attached to the center of this disk on its inner surface; opposite to it and fastened to the frame of the instrument is a second button. The space

between these buttons is filled with granulated carbon. These buttons are the electrodes of the transmitter, the current passing from one to the other by means of the granulated carbon. By this device the vibrations produced in the metal disk by the voice of the speaker are exactly reproduced. The receiver (Fig. 2) consists of a straight or bar electro-magnet with a coil at the end next to the metal disk and having only one pole. By completing the circuit through the carbons in the transmitter, the disk in the re-

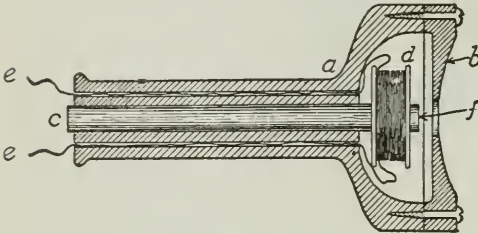


FIG. 2.

ceiver is caused to vibrate in unison so the voice of the speaker, including accent and inflection, is heard by the one holding the receiver.

The telephone has been brought to such a degree of perfection that the voice of a friend more than 1,000 miles away can be heard and recognized as readily as though he were speaking in an adjoining room with the connecting door open, even when he speaks in an ordinary tone.

The Switchboard. Like many other inventions, the telephone has far exceeded in usefulness the greatest anticipations of the inventor. It was designed for use by two parties only, one at each end of the line, but in 1877 Mr. G. G. Hubbard conceived the idea of the switchboard by means of which the lines of a large number of subscribers could be so connected that any subscriber could talk with any other subscriber connected with the system. It was Mr. Hubbard's idea that made possible the great telephone systems with which we are all familiar. The telephones of all the subscribers in a section of a city or in a given area in the country are connected to form an *exchange*. *Trunk lines* connect the exchanges, and by means of this arrangement any subscriber can be connected with any other subscriber in large areas of the United States and Canada.

Automatic Telephone. The automatic telephone is provided with a self-operating

switchboard. Each transmitter has a dial with the figures 1, 2, 3, 4, 5, 6, 7, 8, 9, 0 on its disk. The person wishing to call a number inserts his finger into an opening opposite the first figure in the number desired and turns the dial as far as the stop; he then allows it to return to its former position, and repeats the process for each of the other figures. When he dials the last figure the number called will respond. The switchboard is somewhat complicated, but the automatic telephone is very successful for local purposes, and much less expensive than the manual system because it dispenses with operators at the switchboard.

Present Extent. As already stated, the first public exhibition of the telephone was made in 1876 at the Centennial Exposition. The most far-sighted journals of the country hailed this little instrument as one of the greatest inventions of the age; others ridiculed the idea of an invention by which men could talk with one another at a distance, and called the inventor a "crank." Within a year from that time, however, the telephone had begun to prove its worth, and in August, 1877, 778 telephones were in use. By 1898 fully 1,000,000 telephones had been installed in the United States alone. The expansion of the system has been phenomenal. In 1918 the United States had 22,610,487 miles of telephone wires and 100,376,000 stations, and the daily exchange connections exceeded 30,845,000. About \$1,065,000,000 was invested in telephone plants, and the total revenue was \$294,895,000. There were over 8,000,000 telephones in use in the world, and 5,000,000 of these were owned by the American Bell Telephone Company. Canada has over 890,000 miles of wires and 371,000 telephones in operation. The United States has nearly twice the number of miles of telephone lines found in all the other countries of the world, and Chicago has the largest number of telephones in proportion to its population of any city in the world.

Special Uses of the Telephone. The telephone has a number of uses besides that of ordinary communication. The telephone fire alarm has displaced the old system. In war it is used to keep the commander in chief in touch with every part of his army. Special apparatus which can be quickly set up, taken down and easily carried, is made to accompany an army in the field. On warships the commander is in telephone communication

with every part of his ship. The telephone is in use on many railways in train dispatching. The helmets of divers are fitted with transmitters so that the diver can communicate with the boat above. Instruments have been so perfected that both telephone and telegraph messages can be sent over the same wire at the same time.

Related Articles. Consult the following titles for additional information:

Bell, Alexander G. Telegraph, Wireless
Telegraph Telephone, Wireless

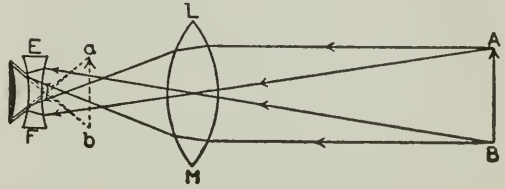
TELEPHONE, WIRELESS. The sounds uttered by the human voice can be transmitted hundreds of miles through the air by the wireless telephone. The chief difference between the wireless and the wire telephone consists in the adjustment of the transmitting and receiving apparatus to waves transmitted through the air instead of over a wire. It requires a much stronger current to send the waves through the air, because they radiate in all directions from the transmitter; therefore, as in wireless telegraphy, it is necessary to connect the transmitter with a condenser which strengthens the current, before it passes to the aerial. The same form of transmitter is used as in the line telephone, and the vibrations of the metal disk when one speaks into the transmitter are transmitted by the atmosphere, as in wire telegraphy (see TELEPHONE; TELEGRAPH).

The waves lose much of their force in transmission and the receiver is more delicate than that used for wireless telegraphy, but it has the same form as that used in the line telephone. A detector which is sensitive is used to strengthen the current so that it will operate the receiver. A system of tuning similar to that used in wireless telegraphy is also frequently employed.

Uses. The wireless telephone can be used for the same purposes as the line telephone, and in addition to these uses it is adapted to others to which the latter cannot be applied. It is installed on warships where it is a convenient means of communication between ships, and the development of the airplane has greatly increased the usefulness of wireless telephony. In the last week of the World War American airplane squadrons were directed in their maneuvers by means of the wireless telephone. Military instruments are equipped with a device by which on signal between the operators the wave length can be instantly changed, thus assuring secrecy. The line telephone has such

extensive systems that the wireless telephone is yet but little used for commercial and social purposes, but its use in these fields is being gradually extended.

TELESCOPE. *tel'eskōhp*, an optical instrument for viewing distant objects, especially the stars. The simplest telescope, invented by Galileo in 1609, by which, though it magnified only thirty times, he was able to discover four of the satellites of Jupiter, con-



sists of a straight tube, with a double convex lens, *LM*, at one end, and a concave lens, *EF*, at the other (see illustration). The convex lens constitutes the object glass, and the concave lens the eyepiece. The eyepiece is placed between the objective and the image formed by it. Rays of light from the object *AB* are refracted by the objective *LM* and would form an inverted image beyond *EF*; but this lens tends to disperse the rays, and the eye sees the image at *ab*. The telescope tube is usually jointed, so that the eyepiece can be adjusted in order to obtain a sharp focus. Opera glasses and field glasses are made by joining together two telescopes of this pattern.

Modern astronomical telescopes are of two classes, the reflecting and the refracting. The *reflecting telescope* consists of a concave mirror, placed at one end of a tube of the same diameter. The tube is pointed toward the object to be viewed, and the image formed by the mirror is placed in the tube at the proper point, by a prism. This reflects the image so that it is viewed through an eyepiece on the side of the tube. Many of the early discoveries in astronomy were made by reflecting telescopes, but owing to the difficulty of their manipulation they have been almost entirely replaced by the refracting telescope.

The *refracting astronomical telescope*, while similar in construction to the smaller instrument, contains many accessories for the purposes of adjustment. The tube is supported on a standard and is so nicely balanced that it can be easily directed to any point in the heavens. It is connected with a sys-

tem of clockwork, by which it is enabled automatically to follow the motions of any heavenly body. The eyepiece is a convex lens, and it magnifies the image. The objective is very large, and it collects a large number of rays of light.

The most noted telescopes are those of the Yerkes Observatory, at Lake Geneva, Wis.; the Lick Observatory, Mount Hamilton, Cal.; the observatory at Pultowa, Russia, and the National Observatory, at Washington, D. C.

The Yerkes telescope is the largest refracting telescope in practical use. It belongs to the University of Chicago, having been presented to that institution by Charles T. Yerkes. The great lens has forty inches of clear aperture, is over three inches in thickness, and weighs 760 pounds. The tube is of sheet steel, forty-two inches in diameter at the objective end, fifty-two inches in diameter in the middle. It is sixty-four feet long, and weighs twelve tons. The pier on which the tube rests and revolves is of cast iron, and stands forty-four feet in height. The dome in which the telescope is situated has a diameter of eighty feet and a height of 100 feet. By pressing an electric button the observer can move the telescope in any direction. The floor of the observatory is also raised and lowered by electric power, at the convenience of the observer.

By the use of the marvelous instrument from the time of Galileo to the present, man has obtained a new idea of the vastness of the universe and the working out of its laws. The comprehension of his own place as a mere atom and not the center of all things has resulted in a profound and revolutionary change in his thought and philosophy. See **ASTRONOMY**.

TELL, WILLIAM, a famous peasant hero of Switzerland, now proved to have been a mythical personage. He is said to have belonged to the Canton of Uri, and to have united with others belonging to this canton and to the cantons of Unterwalden and Schwyz in resisting the Austrians. On his refusal to do homage to Gessler's hat, set upon a pole, he was seized and condemned to death, but he was granted his life on condition of shooting, with an arrow, an apple placed on the head of his own son. This he did successfully, admitting at the same time that his second arrow had been intended for Gessler in case of failure. He was therefore kept a prisoner, but while being conveyed

across a lake in Gessler's boat, he managed to leap ashore, and soon after killed Gessler, who had landed in pursuit of him.

TEMPE, VALE OF, a narrow valley in the northern part of Greece, extending between Olympus, on the north, and Ossa, on the south. The river Salambria flows through the valley, and its scenery is remarkably beautiful. This valley was much celebrated by the ancient poets.

TEMPERANCE, originally moderation in the use of all things; in popular language, moderation in the use of alcoholic liquors, or total abstinence. Among primitive people excessive use of intoxicants has always been associated with religious rites, and indulgence in an appetite for liquors has been prohibited. Among the ancient Chinese, Carthaginians, Persians and Hebrews there were laws against excess, and the Buddhists taught total abstinence. In modern times the temperance movement has often had a deep religious significance, but its appeals have been based chiefly on grounds of health, economy and morality. The United States, Great Britain, Norway and Sweden, Germany, France, Austria and many other nations now have organizations whose object is to lessen or destroy the consumption of liquors and to secure the passage and enforcement of laws which aid this result. For the extent of the movement against the liquor traffic see the article **PROHIBITION**.

TEMPERATURE, the state of a body as regards heat and cold, shown by its ability to communicate heat to other bodies, and measured by an instrument having a graduated scale between two fixed points, known as the thermometer. Temperature as a feature of weather or climate is principally governed by the angle at which the sun's rays strike the earth; the more nearly vertical the rays, the higher the temperature. Bodily temperature remains normally about 98.4° (see **TEMPERATURE OF THE BODY**).

Related Articles. Consult the following titles for additional information:

Climate	Thermometer
Heat	Weather Bureau

TEMPERATURE OF THE BODY. The temperature of the average normal adult of good health is from 98.4° to 98.6° F. A temperature a fraction of a degree above or below these figures is not uncommon, however. In old age and at the beginning of life the temperature is a little above the average, and in case of adults there is a slight rise

during exercise and after a meal. A decided rise of temperature is a sign of disease or other bodily disturbance; usually there is doubt of recovery if the clinical thermometer shows more than 108°. In heat prostration, however, temperatures of 112° and over are not uncommon. A high temperature and rapid pulse usually coincide, there being an increase of about ten beats for each degree of temperature. See FEVER.

TEMPERING, the process of hardening metals, particularly iron and steel. Steel is tempered by being heated to a cherry red and then suddenly cooling. If cooled in water it is very hard, but also brittle. This is corrected by gradual reheating till the hardness is brought down and the toughness increased. The presence of carbon in steel increases its brittleness. Steels of high carbon or of intricate shape are likely to crack when water-quenched, and may be cooled in oil or molten lead. The excellence of razors, knives and all steel-cutting instruments depends on the degree of temper. See ANNEALING; STEEL.

TEMPLARS, KNIGHTS, a military and religious order of Knights established at Jerusalem in 1118, for the protection of pilgrims in Palestine. Subsequently its object became the defense of the Christian faith and of the Holy Sepulcher against the Saracens. The name Templars was adopted because the quarters assigned to the order were in a palace in Jerusalem, known as Solomon's Temple; nine French Knights constituted the original body. The grand master, the chief of the order, had the rank of a prince, and the order acknowledged the pope alone as its protector. Compelled, in 1291, to leave the Holy Land, the Templars transferred their chief seat to the island of Cyprus. The order was abolished in 1312 on the charge that the members had ambitious designs on European thrones and held heretical views.

Modern Knights Templars. This is one of the higher degrees in the order of Free Masonry. See MASONRY.

TEMPLE, in architecture, an edifice designed for the performance of public worship. Magnificent and wonderful temples were erected in ancient Greece, Rome and Egypt. The most remarkable temple in the world, was that built by Solomon, on Mount Moriah, in Jerusalem. It was an oblong stone building, 60 cubits in length, 20 in

width and 30 in height. The interior was divided into the most holy place, or Holy of Holies, and the sanctuary, or Holy Place. The former contained the ark of the covenant and was separated by a curtain from the sanctuary, in which were the golden candlesticks, the table of the showbread and the altar of incense.

This Temple was destroyed by Nebuchadnezzar in 586 B. C.; and after the return of the Jews from the Babylonish captivity, a second Temple, much inferior in splendor, was erected. Herod the Great rebuilt it on a larger scale, surrounding it with four courts, rising above each other like terraces, the lowest of which was 550 cubits square. In the middle of this enclosure stood the Temple, of white marble richly gilt, 100 cubits long and wide and 60 cubits high, with a porch 100 cubits wide. This magnificent edifice was totally destroyed by the Romans in A. D. 70 and on its site the Turks built a mosque, which is known as the Dome of the Rock, or Mosque of Omar.

TEMPLE, TEX., a city in Bell County, thirty-five miles southwest of Waco, on the Gulf, Colorado & Santa Fé and the Missouri, Kansas & Texas railroads. It is surrounded by some of the richest farming land in the state and has a very large trade in cotton. There are cottonseed oil mills, cotton compresses, a large candy factory, flour mills, bottling works and manufactories of agricultural implements. The city has a Federal building, a Carnegie Library, a business college, an academy and two hospitals. The place was settled in 1881. Population, 1910, 10,993; in 1917, 13,904 (Federal estimate).

TENACITY, *te nas'i ti*, the measure of the resistance of bodies to tearing or crushing. Tenacity results from cohesion, or the attraction which exists between the particles of bodies; and the stronger this attraction is in any body, the greater is the tenacity of the body. Tenacity is consequently different in different materials. Wood is more tenacious than lead, and cast steel is still more so. The tenacity of wood is much greater in the direction of the length of its fibers than in the transverse direction. With regard to metals, the processes of forging and wire-drawing increase their tenacity in the longitudinal direction (see WIRE); and mixed metals have, in general, greater tenacity than those which are simple. See COHESION.

TENANT. See LEASE.

TENDER, in law, an offer of compensation or damages made in a money action. To make a tender valid, the money must be actually produced. A tender of money for any payment is called a *legal tender*, if made in current coin of the country. In the United States, if the tender is in pennies, it is not legal to offer more than twenty-five; if the tender is made in silver coins less than one dollar, the amount tendered cannot exceed ten dollars; if made in gold and silver coins, above one dollar, it may be for any amount; if made in United States bank notes, it is legal tender for any amount and for any debt, except for duties on imports and interest on the public debt.

TEN'DONS, the name given to the sinews, or cords, by means of which the muscles are attached to the bones. They consist of bundles of white, fibrous, inelastic and very strong tissue, arranged in bands, separated by areolar or connective tissue. Tendons are often quite long, especially where the parts are slender, those in the fingers extending from the muscle in the upper part of the forearm.

TEN'EMENT, according to statute, any building in which three or more families live. In popular thought, however, the term, derived from the Latin *tenementum*, meaning *holding*, is restricted to houses occupied by several different families of the poorer classes of city populations.

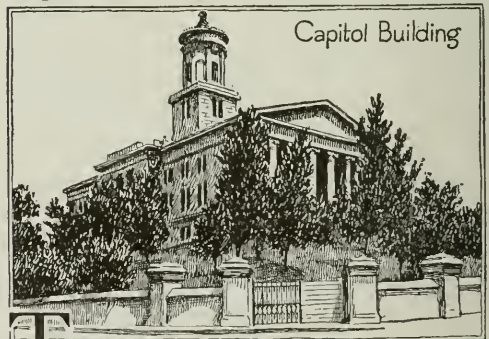
The governments of almost all large municipalities have passed tenement house laws aiming to better housing conditions and to prevent unhealthful congestion. Sociologists and legislators are attacking the problem in all its phases, and have succeeded in eliminating many evils, but there is still much to be accomplished to safeguard the health and safety of the people living in the congested districts of all large cities. To enforce the laws so far as possible, health boards, public health nurses, sanitary inspectors, building commissions and other agencies are appointed. Light and ventilation are now insisted on everywhere. A part of the building lot must be left vacant so as to provide inner courts open to the air and weather. All rooms must have windows opening on such courts or on public streets. Sanitary closets must be provided and arrangements made for a suitable degree of family privacy. Fire protection is looked after, and the height of the buildings is limited.

TENERIFFE, *ten er if'*, the largest of the Canary Islands (which see).

TENIERS, *ten'yerz*, the family name of two famous Flemish painters, father and son.

David Teniers, THE ELDER (1582-1649), was born at Antwerp and was taught his art by Rubens. He chose for treatment almost exclusively scenes from everyday life. His pictures are distinguished for their charm of detail, naturalism and color effect. The most noteworthy are *A Dutch Kitchen*, now in the Metropolitan Museum, New York, *Playing at Bowls* and *Peasants Carousing in Front of a Tavern*.

David Teniers, THE YOUNGER (1610-1690), chose the same kinds of subjects as those painted by his father, and he is recognized as one of the foremost of Flemish genre painters. He, too, was born at Antwerp, and was trained by his father. In 1650 he became court painter at Brussels, and remained there the rest of his life. He executed several hundred pictures, most of them depicting the cheerful scenes he witnessed in the homes and on the streets about him. His works are distributed among all the great galleries of Europe and America. They include *The Barber Shop*, *Peasants' Dance*, *Marriage Festival* and *A Merry Repast*.



TENNESSEE, *ten eh se'*, thirty-fourth among the states of the American Union in area and seventeenth in population, lies south of Kentucky and north of Georgia, Alabama and Mississippi. North Carolina is east, and Missouri and Arkansas are west. Tennessee is popularly called the **BIG BEND STATE**, the name referring to the majestic sweep of the Tennessee River, which lacks but little of flowing twice across the state. The area is 42,022 square miles, of which 335 square miles are water. The population in 1910 was 2,184,789; by Federal es-

timate this had increased to 2,321,253 on July 1, 1918.

Surface and Drainage. What is known as East Tennessee extends from the Smoky Mountains to the crest of the Cumberland Plateau, and contains some of the largest ridges of the Appalachians. Between the eastern ridges and the plateau stretches a valley region about one hundred miles in width, broken by minor elevations and depressions. West Tennessee lies between the Tennessee and Mississippi rivers. The narrow valley of the Tennessee River is skirted on the west by a gravelly ridge running north and south. From this divide a rolling plain slopes toward the west, terminating in steep bluffs, beyond which are the alluvial bottom lands of the Mississippi River. Middle Tennessee is the portion of the state between the crest of the Cumberland Plateau and the Tennessee River. Its chief structural features are a fertile central basin and a sandy, gravelly highland rim surrounding it.

The state is well drained by three great river systems. The Tennessee, formed by the confluence of the French Broad and the Holston, receives the Clinch, the Little Tennessee, the Elk and the Duck. The Cumberland flows into Tennessee from Kentucky, bends southward around Nashville, passes back into Kentucky and flows into the Ohio. The Mississippi River, which forms the western boundary of the state, has several important tributaries in Tennessee.

Climate. The climate is mild and usually delightful, warm in the lowlands of the west and cooler in the highlands of the east. The average temperature for the year at Memphis is 61.3°; at Nashville, 59.3°; at Knoxville, 57.4°. The average annual rainfall is fifty-four inches, and it is well distributed throughout the state.

Mineral Resources. The mineral resources are varied and rich. The coal field coincides in extent with the Cumberland Plateau. The annual output of coal is now about 6,500,000 tons, a considerable increase resulting from war demands in 1917. Iron ore is next in importance, Tennessee being the seventh state in the Union in the production of iron; the quantity mined increased to nearly half a million tons a year under heavy war demands. Phosphate rock of value abounds in the western portion of the central basin and in the northern and western parts of the highland rim. The marbles of East Tennes-

see are noted for their purity and variety. The copper mines produce about 14,500,000 pounds a year, and large quantities of sulphuric acid are produced as a by-product. There is some gold, silver, lead and zinc, with a combined value of nearly \$11,000,000 per year. Other minerals are slate, limestone, sandstone, lithographic stone, zinc and brick and pottery clays.

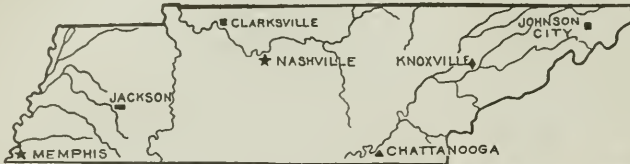
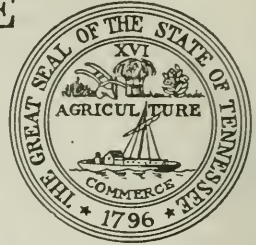
Agriculture. Agriculture is the most important industry; four-fifths of the land being in farms, and nearly half of all the area being improved land. The Mississippi bottoms are unsurpassed in fertility. They produce cotton, Indian corn, alfalfa and other crops in abundance. The most important crops of the state are corn, wheat and cotton. By far the largest acreage is in corn, four times as many acres being devoted to it as are given to hay, the next largest crop. The corn is worth, at normal prices, about \$60,000,000 a year; hay, over \$20,000,000. Cotton is worth over \$17,000,000 a year; wheat, about \$10,000,000 normally. Other products are tobacco, oats, potatoes, sorghum, peanuts and garden vegetables. Pears, peaches, apples and strawberries are extensively cultivated. Trucking for the Northern markets is an important industry in some portions of West Tennessee. Livestock raising and dairying are important.

Manufactures. The manufactures are extensive and are rapidly increasing, and Tennessee is twenty-sixth among the states in the value of its manufactured products. Nashville is the principal center of flour milling. Lumbering is an important industry in all parts of the state, and furniture, agricultural implements and other articles of wood are manufactured. Some of the largest hardwood cabinet factories in the United States are located at Knoxville. There are many large factories for iron and steel products. Other manufactures are tobacco, cotton and woolen goods, cottonseed oil and cake, leather and leather goods, clothing, wagons, carriages and plows.

Transportation. Tennessee has a railway mileage exceeding 4,300. The principal roads are the Nashville, Chattanooga & Saint Louis, the Louisville & Nashville, the Southern, the Tennessee Central and the Illinois Central. The Cumberland, Tennessee and Mississippi are navigable rivers, the last furnishing communication with the entire Mississippi valley.

TENNESSEE

THE BIG BEND STATE

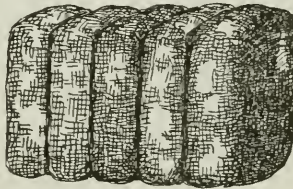


Key to Population

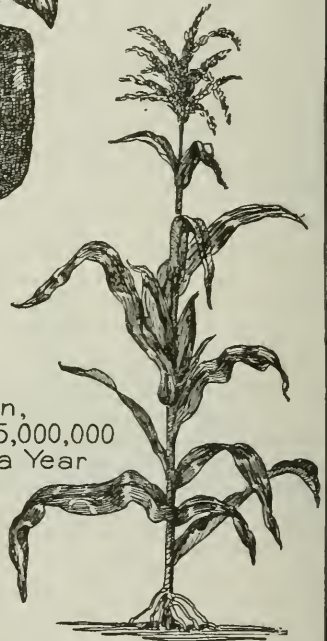
- ★ Between 115,000 and 150,000
- ▲ Between 60,000 and 65,000
- ◆ Between 35,000 and 40,000
- Between 16,000 and 20,000
- Between 8,000 and 12,000



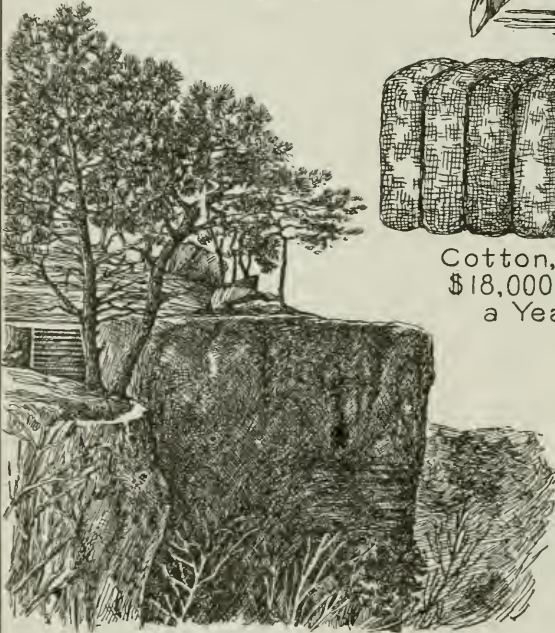
Tobacco,
\$5,000,000 a Year



Cotton,
\$18,000,000
a Year



Corn,
\$55,000,000
a Year



The Leap,
Lookout Mountain

Cities. There were six cities in the state with populations exceeding 10,000 in 1917. These were Memphis (151,877); Nashville, the capital (118,136); Chattanooga (61,575); Knoxville (59,112); Jackson (17,946); Johnson City (11,885). Memphis is fortieth among United States cities in population.

Education. The public schools are maintained by the interest on the permanent

school fund, appropriations from the state treasury and taxes levied in the counties. Many cities and towns supplement these funds by local taxation. The state appropriates to public education about one-fourth of its annual revenues. This is apportioned to the elementary schools, county high schools, the four state normal schools, the state university, and to school libraries.

White and colored children attend separate schools. The state normal schools are at Johnson City, Murfreesboro, Memphis and Nashville; the latter is an agricultural and industrial normal. Tennessee is favored with numerous universities and colleges of high rank. At the head of the system of schools is the University of Tennessee at Knoxville. Other schools of importance are the following; they are coeducational, except as otherwise noted:

Bristol College, Spencer.
 Carson and Newman College, Jefferson City.
 Christian Brothers College (Catholic, for men), Memphis.
 Cumberland University, Lebanon.
 Howard College for Young Ladies, Gallatin.
 King College (for men), Bristol.
 Lincoln Memorial University, Cumberland Gap.
 Maryville College, Maryville.
 Memphis Conference Female Institute, Jackson.
 Milligan College, Milligan.
 Southwestern Presbyterian University (for men), Clarksville.
 Sullins College (for women), Bristol.
 Synodical College for Females, Rogersville.
 Tennessee College (for women), Murfreesboro.
 University of Chattanooga, Chattanooga.
 University of the South (for men), at Sewanee.
 Vanderbilt University, Nashville.
 Ward-Belmont College for Young Women, Nashville.

There are three schools of college grade for negroes. These are Fisk University at Nashville, Knoxville College at Knoxville, and Walden University at Nashville.

Institutions. The school for the deaf and dumb is at Knoxville; the school for the blind and the state reformatory are at Nashville. The hospitals for the insane are at Bolivar, Nashville and Knoxville. The penitentiary, at Nashville, has a branch at Petros. A school for the blind is at Nashville, and the state supports a Confederate Soldiers' Home, on "The Hermitage," formerly the home of Andrew Jackson, near Nashville.

Government. The legislature consists of a senate and a house of representatives. The number of representatives cannot exceed ninety-nine and the number of senators is limited to one-third the number of representatives. Clergymen are not eligible to membership. The members of both houses are elected for two years. The legislature meets biennially; regular sessions are limited to seventy-five days and special sessions to twenty days. The executive department con-

sists of a governor, elected by the people for two years; a secretary of state, elected by the legislature for four years, a treasurer and a comptroller of the treasury, elected by the legislature for two years, and an attorney-general appointed by the judges of the supreme court for eight years. The superintendent of public instruction and the commissioner of agriculture are appointed by the governor and confirmed by the senate for a term of two years. The courts consist of a supreme court, with five judges, one of whom is chief justice; a court of civil appeals, with five judges, all elected by the people for eight years, and circuit, chancery and other inferior courts, the judges of which are elected by the people of their districts for eight years.

History. Probably the first white man to visit Tennessee was DeSoto. Later LaSalle built a fort at the site of Memphis. During the eighteenth century English explorers from the eastern colonies ventured into the region, among them Daniel Boone, James Robertson and others, and established posts for trade with the Indians. In 1772 the Wau-tauga Association was formed, under which the territory was governed almost independently for several years. It was, however, annexed to the State of North Carolina in 1776. Indian troubles were frequent, and the fact that the government of North Carolina did not take active measures to end these outbreaks, together with the indignation aroused at the presumption of North Carolina in ceding the territory of Tennessee to the Federal government, without consulting the inhabitants, led to the formation of a state known as "Frankland" or "Franklin," with John Sevier as governor. However, North Carolina soon regained possession. After 1790 the territory was known as the "Territory South of the Ohio," until June 1, 1796, when it was admitted as the sixteenth state.

The progress of the new state was rapid, thousands of immigrants entering from all the Eastern states. The sentiment of the people of Tennessee was divided at the outbreak of the Civil War, but after a period of hesitation the state seceded in June, 1861. It furnished more than 100,000 soldiers to the Confederate army and about 30,000 to the Federal army, and it was the scene of some of the severest fighting of the war. Andrew Johnson, a War Democrat, was appointed

Items of Interest on Tennessee

The Valley of East Tennessee, which is a part of the great Appalachian Valley, consists of parallel ridges and valleys developed by erosion on shale, sandstone, and limestone; in the northeast the ridges are more numerous and higher than in the southwest.

Reelfoot Lake, eighteen miles long and three miles wide, in the northwestern part of the state, is its only large lake; it occupies a depression formed during an earthquake in 1811.

The average number of clear, fair, or only partly cloudy days during the year is 260.

The warm, moisture-bearing winds blow low from the south or southwest with a free sweep across the state; the average velocity is low, and violent storms are rare.

The character of the soil varies greatly; in general the valleys and lowlands are exceedingly fertile.

The average size of farms in the state is 81.5 acres.

On account of the scarcity of coin and paper money in the state before Tennessee was admitted to the Union, more than twenty articles were valued and declared legal tender; among them were fox skins, beaver skins, bacon, and rye whisky.

Questions on Tennessee

What is the average elevation of the state? Name some of the highest peaks.

What is the average size of the farms?

What percentage of the farm area is worked by owners?

How many miles of railroad has the state?

To what extent is the employment of women and children in factories regulated?

Name five important educational institutions.

What is the purpose of Lincoln Memorial University?

What is the state capital? What President lived near that city? Why is it important in industry and commerce?

military governor and attempted to reorganize the state as a part of the Union, but met with rebuffs from Congress. For a time after the war there was much disorder, but soon Tennessee entered upon another period of progress, which has not been interrupted. Before the advent of national prohibition a drastic prohibition law became effective. The state's finances are controlled on the budget system (see BUDGET), and there is a compulsory system of primary elections. Women were granted Presidential suffrage in 1919.

Related Articles. Consult the following titles for additional information:

CITIES

Bristol	Johnson City	Memphis
Chattanooga	Knoxville	Nashville
Jackson		

HISTORY

Chattanooga, Battle of	Frankland
Fort Henry and Fort	Murfreesboro, Battle of
Donelson	Shiloh, Battle of

RIVERS AND MOUNTAINS

Cumberland Mountains	Mississippi River
Cumberland River	Tennessee River

* **TENNESSEE, UNIVERSITY OF**, a state university located at Knoxville. It was established in 1794 as Blount College. In 1807 the name was changed to East Tennessee College, and two years later to East Tennessee University. The present name was adopted in 1879. In 1909 the institution was recognized as an integral part of the public school system of the state. It contains the state college of agriculture and mechanic arts, and receives for the support of this college all the Federal funds allotted to the state for this purpose. It also has the Tennessee Experiment Station, supported by Federal and State funds. It maintains a branch station at Jackson, carries on co-operative agricultural experiments in Middle Tennessee, and conducts short courses in agriculture at a number of places in all sections of the state. There are colleges of liberal arts, commerce, law, medicine and dentistry, the summer school and the graduate school. The colleges of medicine and dentistry are at Memphis. The student enrollment is over 2,000 and the faculty numbers more than 200. There is a library of 42,600 volumes.

TENNESSEE RIVER, the largest tributary of the Ohio River, formed by the Clinch and the Holston, which rise in Virginia and unite in the eastern part of Tennessee. It flows southwestward to Chattanooga, crossing the Alleghany Mountains, thence flows westward through the northern part of Alabama, then northward and northeastward and again northwestward, crossing Ken-

tucky and joining the Ohio near Paducah. It is about 800 miles long—1,200 miles, with the Holston. It is navigable for large steamboats to Florence, Ala., where it is obstructed by shoals. A canal around these has extended the navigation for steamers as far as Kingston.

TENNIEL, *ten neel'*, JOHN, Sir (1820-1914), one of the most famous illustrators, born in London. He painted one of the frescoes in the Houses of Parliament in 1845, but he painted only a few pictures. From 1851 to 1901 he was connected, as an illustrator, with *Punch*, and produced over two thousand cartoons for that paper, in particular the weekly political cartoon. He also illustrated many Christmas and other books, including *Aesop's Fables*, *Ingoldsby Legends* and *Alice's Adventures in Wonderland*.

TEN'NIS, a game played on an oblong walled court (not to be confused with *lawn tennis*). Two players, using balls and rackets similar to those of lawn tennis, keep the ball bounding against a wall, striking it alternately, the object being to keep it going as long as possible. The game was introduced into England in the thirteenth century, and it continued to be very popular with the nobility to the reign of Charles II. See **LAWN TENNIS**.

TEN'NYSON, ALFRED, first Baron Tennyson (1809-1892), the greatest representative poet of the Victorian Age, born at Somersby, Lincolnshire, Aug. 6, 1809. With the exception of four years spent at the Louth Grammar School, his early education and preparation for college were directed by his father, rector of the parish. In 1828 he entered Trinity College, Cambridge, where he distinguished himself as a student, and where, in 1830, he won a medal, with his prize poem, *Timbuctoo*. He had published, in 1827, in conjunction with his brother Charles, *Poems by Two Brothers*, but this work gave little indication of his peculiar genius; and his first really important



ALFRED TENNYSON

work was a volume of *Poems, Chiefly Lyrical*, which appeared in 1830, and which revealed undoubted genius. In this very productive period, two years later, a second volume appeared, which won for its author recognition as a true poet. It contained many of his most beautiful shorter poems, *The Lady of Shalott*, *Oenone*, *The Lotus-Eaters* and *A Dream of Fair Women*.

Partly because of adverse criticism, but chiefly because of his deep affliction in the death of his friend, Arthur Hallam, the next nine years of his life were spent in retirement and in complete devotion to his art. As a result of these years of study, brooding and reflection, came the two volumes of 1842, which showed, in such notable poems as *Morte d' Arthur*, *Dora*, *Locksley Hall*, *Ulysses*, *The Two Voices* and *Break, Break, Break*, that the poet's power was reaching its maturity. From this year dates Tennyson's supremacy. *The Princess*, with its exquisite lyrics, was published in 1847, and following this in 1850 came *In Memoriam*, in some respects the finest elegiac poem in the language. The suffering and doubt and final triumph of faith, which had been Tennyson's personal experience after the death of Arthur Hallam, and the general tendency of the age to skepticism and materialism, which must finally emerge in a deeper and nobler faith and understanding, find expression in this series of lyrics. In this same year Tennyson succeeded Wordsworth as poet-laureate; and he married Miss Emily Sellwood, to whom he had been for years betrothed.

Maud, and *Other Poems* was published in 1855, but was not received with marked enthusiasm. This coldness, however, was more than compensated by the revival of popularity in 1859, when the *Idylls of the King* appeared. In 1864 came *Enoch Arden*, perhaps the most popular of Tennyson's poems. During his later years he made several attempts at dramatic composition, but, though his productions are excellent, they cannot rank with the best. In 1889 appeared the volume called *Demeter and Other Poems*, which contained *Crossing the Bar*.

In 1884 he was made a baron. During his remaining years he lived in the retirement he had always chosen, and his life was ended fittingly by a quiet death in his summer home at Alderworth, Sussex, Oct. 6, 1892. He was placed in Westminster Abbey, next to Chaucer and Robert Browning.

Tennyson's marvelous mastery of the form of verse, his keen sensibility to both material and spiritual beauty and his sympathy with the dominant longing of his age for truth, make him at once its truest and greatest exponent and one of the rarest of the world's poets. Consult Stopford Brooke's *Tennyson, His Art and Relation to Modern Life*.

See the article Reading, for additional material relating to Tennyson.

TENT. See CAMPS AND CAMPING.

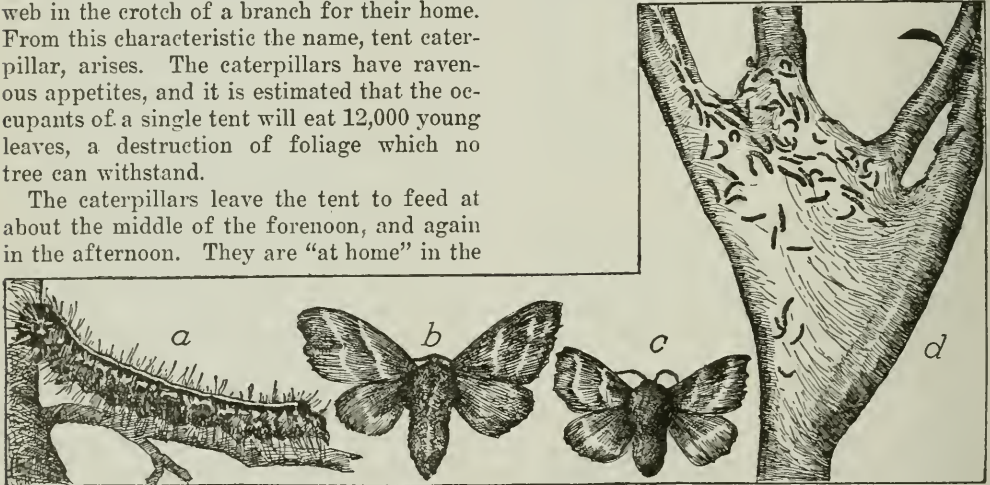
TENT CATERPILLAR, *kat'er pil ar*, the caterpillars or larvae of four species of silk-spinning moths. The apple-tree tent caterpillar is the most destructive and the best known. The female is a dull reddish-brown moth, with two oblique pale stripes on the fore wings. In July the eggs, about 300 in number, are laid in rings or belts around the small twigs on apple and wild cherry trees. The eggs are firmly cemented together and remain on the twig until the following spring, when the young appear and spin a tentlike web in the crotch of a branch for their home. From this characteristic the name, tent caterpillar, arises. The caterpillars have ravenous appetites, and it is estimated that the occupants of a single tent will eat 12,000 young leaves, a destruction of foliage which no tree can withstand.

The caterpillars leave the tent to feed at about the middle of the forenoon, and again in the afternoon. They are "at home" in the

ent silk, in which they change. Within twenty or twenty-five days the moths issue from the cocoons and soon after lay their eggs for next year's brood.

The forest tent caterpillar, or forest army worm, is common in the eastern part of the United States, and there are two varieties on the Pacific coast, the California tent caterpillar, which is found on oak trees in the spring, and another variety that attacks fruit trees.

TENURE OF OFFICE ACT, an act passed by the Congress of the United States in 1867 limiting the President's power to remove officers appointed by him. According to the Constitution, the consent of the Senate is not required. Until the date named it had been the prerogative of every President to dismiss any official who had come into office by Presidential appointment. Soon after Andrew Johnson was inaugurated he came into conflict with Congress on the question of reconstruction. Fearing that the



TENT CATERPILLAR

(a) Full grown caterpillar. (b) Female moth. (c) Male moth. (d) Tent caterpillar.

early morning and in the evening, and by burning the tents or spraying them with kerosene at these times most of the caterpillars can be destroyed. The eggs are easily seen, and may be removed from the trees and destroyed during the winter. Many eggs are eaten by birds that remain in the locality during the winter. The caterpillars reach their full growth in about forty days, after which they leave their nest to find sheltered places under leaves, fence rails, etc., and spin a spindle-shaped cocoon of almost transpar-

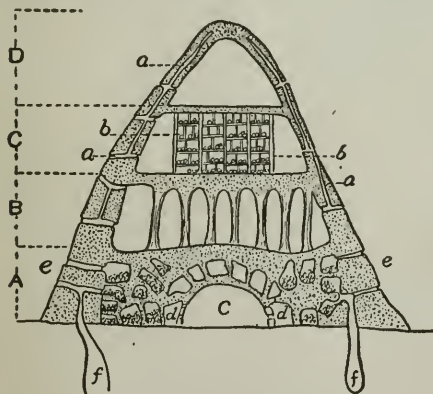
President might exercise the unlimited power of removal allowed him by the Constitution and thus interfere with the Congressional policy of reconstruction, Congress passed the Tenure of Office Act, which made all removals impossible without the consent of the Senate. Johnson, taking the stand that the act was unconstitutional, ignored it, and in his attempt to remove Edwin M. Stanton, Secretary of War, brought about his own impeachment. In 1887 the act was repealed. See CIVIL SERVICE.

TERCEIRA, *ter se' e ra*. See AZORES.

TERENCE, *ter' ens*, (about 185-159 B. C.), in full, Publius Terentius Afer, a celebrated Roman writer of comedies. He was born in Africa, and while a child was bought by Publius Terentius Lucanus, a Roman senator, who took him to Rome, gave him a good education and finally freed him. The first play which he produced, *Andria*, won him recognition and popularity. About the year 161 he went to Greece, where he translated many of Menander's comedies. According to some accounts he died in Greece; according to others he was drowned in his passage back to Italy. Six comedies of Terence's are extant, and these are all he is known to have produced: *Andria*, *The Eunuch*, *The Self Tormentor*, *Phormio*, *The Stepmother*, and *the Adelphi*, his last piece, brought out in Rome the year before his death.

TERHUNE, *ter hune'*, MARY VIRGINIA HAWES (1831-), an American writer, best known by her pen name of MARION HURLAND. From the time she was fourteen years old she wrote for the press. In 1888 she became editor of *The Homemaker*. She has conducted departments in *Wide Awake*, *Saint Nicholas* and many other periodicals and in daily newspapers. Among the novels which she has published are *The Hidden Path*, *Miriam*, *Judith*, *True as Steel* and *Moss-Side*.

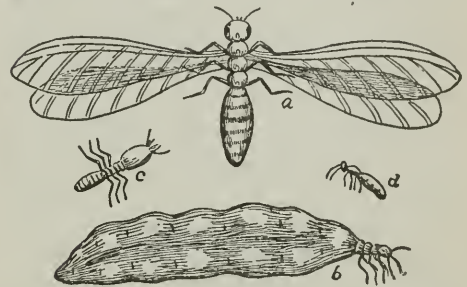
TERMITES, *ter' mites*, a family of insects, commonly known as white ants. They live



TERMITE'S NEST

In the above diagrammatic section of a termite's nest, D, represents a well-aired empty attic, C, the next story, the nursery, where the young termites are hatched; B, a hall, supported by pillars; A, the ground story; a, winding passages in the walls; b, the shelves on which the young termites are hatched; c, the royal chamber, in which the king and queen are imprisoned; d, the chambers of the worker termites; e, store chambers; f, holes in the ground out of which the material used in making the nest is dug.

much like the ants, though really they have little relationship to them. Termites are confined to the tropics and are especially plentiful in western Africa. They live in colonies, raising large dwellings, in the form of irregular pyramids or cones, to the height of ten or twelve feet. These structures are firmly cemented and are strong enough to bear the weight of several men. Each is divided into various apartments, chambers and galleries, which have their specific uses, like the rooms



TERMITES

a, perfect male; b, female distended with eggs; c, soldier; d, worker.

of a house. In every colony there are a king and a queen, both of which are much larger than the rest of the insects; they are constantly kept together in a large chamber in the heart of the hive, where they are attended by a detachment of workers. The queen lays the eggs at intervals, and workers carry them off to the small cells in which the larvae are reared. As in the case of the bees, the king and queen make a nuptial flight, after which the wings break off. The other members of the colony are wingless except at certain seasons of the year, when a brood with wings is reared and sent away to found a new colony. There seem to be two classes of neuters, the workers and the soldiers. It is the duty of the former to build the habitations, make covered roads, nurse the young, attend the king and queen and manage the domestic affairs of the colony. The soldiers have powerfully developed mandibles, and they defend the community with desperate courage from any attacks. In the tropics, some species are terribly destructive, as they sometimes riddle the timbers of a house before their presence is even known. One species of termites is native of the United States.

TERN, *turn*, a group of birds related to the gulls, found along lakes and rivers and on the seacoast in every part of the world. They are remarkable for their power of flight. The

wings are very long and pointed, the tails forked. The largest of about fifty species, the *Caspian* tern, has a wing expanse of about four feet. The smallest is the *least* tern, which is a little more than eight inches long. One of the most beautiful is the *common* tern, seen occasionally on the Atlantic coast. It has pearl-gray plumage, a white throat and tail, and is about fourteen inches long. The terns nest in colonies, usually on uninhabited rocky islands. They lay the eggs upon a rough nest of sticks or upon the bare rocks. There are about ten species in North America, among which are the *gull-billed*, *sooty*, *black* and *royal*.

TERPSICHORE, *terp sik'o re*, in Greek mythology, one of the nine Muses, the originator and patroness of the dance. She is represented as a laurel-crowned virgin holding in her hand a lyre. See **MUSES**.

TERRA COTTA, from an Italian word meaning *baked earth*, is baked clay or burned earth, a similar material to that from which pottery is made, much used, both in ancient and modern times, for architectural decorations, statues, figures and vases. As now made, it usually consists of potter's clay and fine powdered silica. It is produced in many different colors, the most pleasing being a rich red and a warm cream color. Large numbers of ancient statues, especially statuettes, of terra cotta have been found in recent times. Terra cotta is extensively used by architects for ornamenting buildings.

A large part of terra cotta work is made in plaster of Paris molds. Cornices and other architectural decorations, in which many pieces are just alike, can best be divided into numerous sections and cast. In the process of firing, terra cotta shrinks about one inch to the foot, and allowance must be made for this in the molding. Terra cotta may be glazed or enameled beautifully in white and colors, the work being done exactly as in the case of tile glazing. See **POTTERY**.

TERRAPIN, the popular name of several species of turtles. They are covered with a slightly-curved, circular shell, and are able to draw legs, head and tail under this horny plate. They inhabit ponds, swamps and rivers, in tropical and temperate regions, and feed on vegetable food, fish, small reptiles and other animals. Terrapins are more agile on land than many other turtles, and they are good swimmers. In the United States the name is applied most frequently to the dia-

mond-back terrapin, a salt-marsh denizen whose flesh is considered a great table delicacy. It is common in the marshes along the South Atlantic coast. In some sections terrapins are reared in enclosures for the market.

TERRE HAUTE, *ter e hote'*, IND., county seat of Vigo County, seventy-two miles southwest of Indianapolis, on the Wabash River and on the New York Central, the Pennsylvania, the Chicago & Eastern Illinois, the Evansville & Indianapolis, the Evansville & Terre Haute, and the Chicago, Terre Haute & Southeastern railroads and several electric lines. The city is located on the high terraces of the Wabash River, is regularly laid out, with broad streets, and has several parks. It is the seat of the Rose Polytechnic Institute, the Indiana State Normal School and Saint Mary's Institute, and it has several orphanages, hospitals and the Rose Dispensary. The public library, the Federal building, the courthouse, the city hall, the opera house and the union station are some of the most prominent structures. The surrounding country is agricultural and contains valuable coal mines. Industrial establishments include glass plants, foundries, machine shops, flour and hominy mills, clothing factories, rolling mills, packing houses, car works, planing mills and manufactories of carriages, electric motors, enameled ware, paving brick, stoves and tools. The place was founded in 1816, and was chartered as a city in 1833. Population, 1910, 58,157; in 1917, 67,361 (Federal estimates).

TERRIER, a small dog, remarkable for the eagerness and courage with which it goes into holes in the earth to attack foxes, badgers, cats, rats and the like. The name is taken from the Latin *terra*, meaning *earth*, and refers to the terrier's method of hunting. There are about fifteen varieties. In Great Britain two kinds are common; these are the *Scotch terrier*, rough and wire-haired, and the *English terrier*, smooth-haired and generally more delicate in appearance. The *Skye terrier*, a sub-variety of the Scotch terrier, is much prized. The *pepper and mustard* breeds, rendered famous by Sir Walter Scott, are also highly valued. The *black and tan* terrier has a sleek and soft coat. All terriers are vigorous and intelligent and have very keen senses. Few other breeds of dogs are greater favorites.

Related Articles. Consult the following titles for additional information:

Dog
Fox Terrier Scotch Terrier Skye Terrier

TERRITORY, a term applied in the United States to an area similar to a state of the Union, but without the independent position of a state, governed directly by Congress, through a governor and other chief officials, appointed by the President, and a legislature of certain limited powers. Territories are usually admitted as states on attaining a sufficient population and adopting a constitution approved by congress. There are no territories remaining in the continental United States, but Alaska, Hawaii, the Philippine Islands and Porto Rico are yet governed as territories.

TERROR, REIGN OF, the term usually applied to the period of the French Revolution from the appointment of the Revolutionary Tribunal and the Committee of Public Safety, in April, 1793, to the fall of Robespierre in July, 1794. See FRENCH REVOLUTION.

TERRY, ELLEN ALICIA (1848-), a famous English actress, born at Coventry. She made her first appearance on the stage when only eight years old, playing Manilius in Shakespeare's *Winter's Tale* at the Princess's Theater, under the management of Charles Kean. In 1858 she acted the part of Arthur in *King John*, and in 1863 she made her debut as a regular performer, playing Gertrude in *The Little Treasure* at the Haymarket. She married Watts, the painter, in 1864 and left the stage. She was the model for his great painting, Sir Galahad. In 1867 she was divorced, and again entered upon a stage career, reappearing at the New Queen's Theater, London. In 1879 she made her first appearance at the Lyceum, and for almost a quarter of a century she assisted Henry Irving in his presentation of many of the greatest of classic and modern plays. In Tennyson's *The Cup*, in *Romeo and Juliet*, *Faust*, *Eugene Aram* and *Becket*, she proved her right to rank with the greatest of English actresses, but it was as Portia, in the *Merchant of Venice*, that her strongest work was done. In company with Irving she made many visits to America and always met with great success.



ELLEN TERRY

TERTIARY, *tur'she a ri*, **PERIOD**, a term formerly employed in geology to designate the first division of the Cenozoic Era. The rocks formed in this period constitute the tertiary system. At one time it was thought that each stratum of rock contained three distinct formations, primary, secondary and tertiary. The English geologist Lyell divided the tertiary system into four epochs—Eocene, Oligocene, Miocene and Pliocene. The United States Geological Survey has grouped these epochs into two, Eocene and Neocene, and this classification is generally adopted in the United States. The term *tertiary* is now little used. See CENOZOIC ERA; GEOLOGY.

TERTULLIAN, one of the foremost of the early Christian fathers, the first of the great Latin writers of the Church. He was born at Carthage, North Africa, of heathen parentage, in the latter part of the second century, and was educated for the law. In his early manhood he went to Rome and was converted to Christianity. He returned to Carthage, where he became a presbyter; but moral laxity in the Church caused him to withdraw, and he thenceforth lived a life of extreme severity. His writings reveal intensity of character, moral strength, keen satire and earnestness. Chief of these is the *Apology*, a vindication of the Church against its heathen detractors.

TESLA, NIKOLA (1857-), a famous electrician, born at Smiljan, Croatia. He was educated at the Polytechnic School at Gratz and at the University of Prague, and worked for the Austrian government until 1881. In 1884 he emigrated to America, was naturalized and became associated with Thomas A. Edison. Subsequently, for purposes of research, he opened laboratories of his own in New York City and made numerous practical inventions. To him is due credit for the discovery of the rotary magnetic field and its practical application to the induction motor; for substituting the alternating current for the direct current; for many improvements in dynamos, arc lamps, incandescent lights, induction coils and condensers.

TEST ACTS, the general term applied to various acts of the English Parliament, which made the holding of public offices conditional on certain religious tests. The name especially belongs to the Corporation Act of 1661, which decreed that all magistrates must take the oaths of allegiance and supremacy and must receive the communion according to the

Church of England; and to the Test Act of 1673, which imposed the same tests on the holders of all public offices. These statutes, after various modifications, were finally repealed in 1829.

TET'ANUS, the disease commonly known as *lockjaw*. In warm climates this is a frequent result of wounds, and it consists in spasmodic contraction of the muscles. This is often strong enough to draw the body entirely out of shape and to hold the lower jaw so closely against the upper that it is impossible to separate them. The disease is a terrible one and is usually fatal, as not more than ten per cent of well-developed cases recover. The disease is infectious and is caused by the presence in the wound of a bacterium common in dirt or the soil of gardens. Treatment by serum is the only cure. See **SERUM THERAPY**.

TETRAZZINI, *tet ra tsé'ne*, LUISA (1874-), a famous Italian soprano, born at Florence. She learned many operas before the age of twelve, by listening to the singing of her sister, and so wonderful was her early ability that she was given an excellent musical education. Her first public appearance was in her native city in 1895. Afterwards, she sang in grand opera and concert in the principal cities of the world, and gained wonderful popularity, ranking with the greatest singers of her time. Her favorite operas were *Lucia di Lammermoor* and *La Sonnambula*.

TET'ZEL, JOHANN (1460-1519), the chief opponent of Martin Luther at the beginning of the Reformation (which see), was a German monk of the Dominican Order. He was born in Saxony and was educated at the University of Leipzig. He joined the Dominicans soon after his graduation. He was an eloquent and forceful preacher and was entrusted with the proclamation of an indulgence on behalf of the Teutonic Knights from 1503 to 1510. Again in 1516 he was given a similar mission for the purpose of raising money to complete Saint Peter's Church in Rome. It was in connection with this mission that Tetzel aroused the opposition of Luther, whose famous ninety-five theses were directed against Tetzel and his methods. Tetzel's published reply contained language which the Church considered extravagant and intemperate, and he was summoned to appear before the Papal legate, by whom he was severely reprimanded.

TEUTONIC KNIGHTS, *tu ton'ik nites*, a religious and military order, founded in 1190 by a group of German merchants for the purpose of relieving the sufferings of the Crusaders at Acre, in Palestine. Like the Knights Templars and Knights Hospitalers, which sprang up at about the same time, it originally was an organization of noblemen and knights, but later its membership included priests and lay brothers. After their conquests in Palestine the Teutonic Knights, in 1225, began a crusade of Prussia, which was largely pagan, and from 1283 to 1466 they held sway there. After this the order declined rapidly, though a few loyal knights continued its existence until 1809, when it was dissolved by Napoleon and its properties in all countries were confiscated. The emperor of Austria reorganized the Teutonic Knights in 1840 as an Austrian imperial order, for service such as that performed by the Red Cross Society.

TEUTONIC RACES, a term now applied to the High Germans, including the German inhabitants of Upper and Middle Germany and those of Switzerland and Austria; the Low German, including the Frisians, the Plattdeutsch, the Dutch, the Flemings, and the English descended from the Saxons, Angles and other tribes who settled in Britain; the Scandinavians, including the Norwegians, the Swedes, the Danes and the Icelanders.

TEXARKAN'A, ARK. and TEX., adjoining cities on the boundary line, one the county seat of Miller County, Ark., and the other in Bowie County, Tex. They are 145 miles southwest of Little Rock, Ark., on the Texas & Pacific, the Kansas City Southern, the Saint Louis Southwestern and the Saint Louis, Iron Mountain & Southern railroads. The towns have separate city governments, but form a single industrial community. A postoffice, situated on the state line, is used by both cities. There are many fine residences and good business blocks, a Y. M. C. A. building, a railroad hospital and more than thirty churches. The educational institutions are the Saint Agnes Academy, the Saint Rose of Lima Academy and the Texarkana Industrial College. The place has a large trade in lumber, cotton and hides. The leading industrial establishments are cotton works, railroad shops, lumber mills, machine shops and furniture and pottery factories. Both towns were settled in 1873 and became incorporated cities in 1887. Population, in Arkansas,

TEXAS

THE LONE STAR STATE



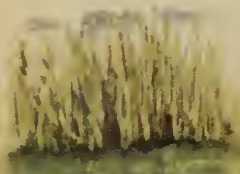
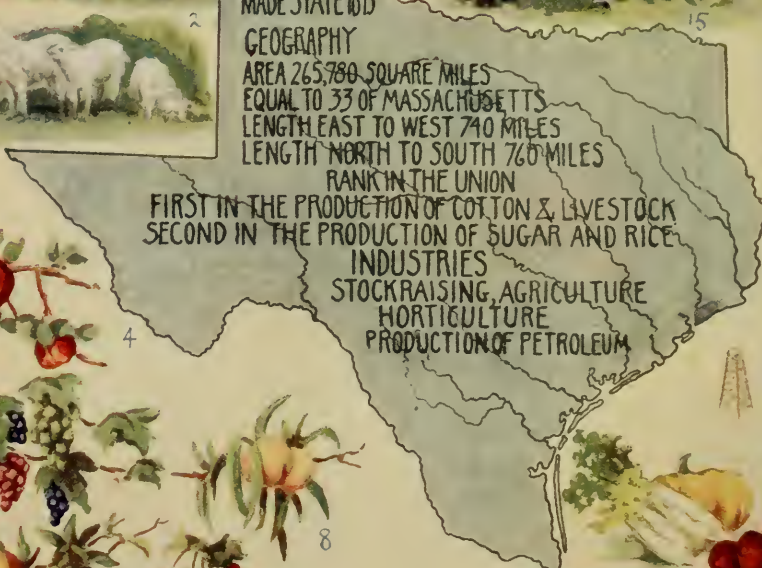
HISTORY
 EXPLORED 1528
 SETTLED 1685
 INDEPENDENT 1836
 MADE STATE 1845

GEOGRAPHY

AREA 265,780 SQUARE MILES
 EQUAL TO 33 OF MASSACHUSETTS
 LENGTH EAST TO WEST 740 MILES
 LENGTH NORTH TO SOUTH 760 MILES
 RANK IN THE UNION

FIRST IN THE PRODUCTION OF COTTON & LIVESTOCK
 SECOND IN THE PRODUCTION OF SUGAR AND RICE

INDUSTRIES
 STOCKRAISING, AGRICULTURE
 HORTICULTURE
 PRODUCTION OF PETROLEUM



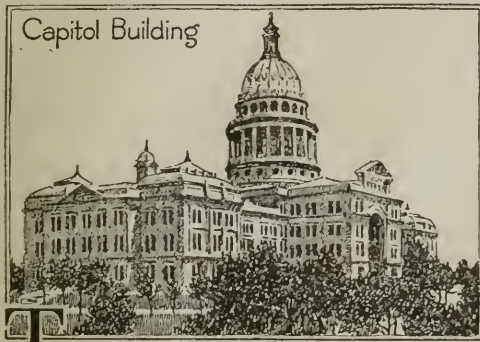
1, Rice.
 2, Cattle and Swine.
 3, Sheep.
 4, Apples.

5, Grapes.
 6, Pears.
 7, Strawberries.
 8, Peaches.

9, Rice Field.
 10, Sugar Cane.
 11, Cotton Field.
 12, Vegetables.

13, Oil Well.
 14, Corn.
 15, Draft Horses.
 16, Oats.

1910, 5,559; in 1917, 6,195 (Federal estimate); in Texas, 1910, 9,886; in 1917, 13,099 (Federal estimate). Combined population, 1910, 15,445; in 1917, 19,294 (Federal estimate).



TEXAS, the largest state of the American Union, in area and natural resources worthy of being compared with many of the world's independent nations. It was, in fact, admitted into the Union when an independent republic, something that can be said of no other state. Its popular name, the *Lone Star State*, refers to its flag, which bears a single star. This was also the emblem of the republic of Texas. Its special flower is the bluebonnet.

Location and Area. Texas is one of the south-central states. Only Florida extends farther south, and a line through the exact center of the state would fall but slightly west of a line running midway between the Atlantic and Pacific oceans. Mexico and the Gulf of Mexico form the southern boundary; Louisiana and Arkansas touch the state on the east, Arkansas and Oklahoma are on the north, and New Mexico is on the west. Texas is more than one-twelfth the size of the entire United States, exclusive of Alaska and the Philippines, and is larger than either France or Germany. Among the Canadian provinces, however, it is exceeded in size by Quebec, Ontario and British Columbia. Its length from north to south is 760 miles; its breadth from east to west is 740 miles, and its gross area is 265,896 square miles, of which 3,498 square miles are water.

People. In 1910, with a population of 3,896,542, Texas ranked fifth among the states in number of inhabitants. Its density per square mile, however, was only 14.8; thirty-five states were more thickly populated. In 1918, according to Federal estimates, the population was 4,601,279. Texas has about

700,000 negroes and over 125,000 Mexicans, the latter constituting the largest element in the foreign-born population. Germans, Austrians and English are next in order.

The largest religious bodies are the Baptists and Methodists, followed by the Roman Catholics, Disciples of Christ, Presbyterians and Episcopalians.

Cities. Dallas and San Antonio, each with over 128,000 inhabitants (1917) are the largest cities; the next five, in order, are Houston, Fort Worth, El Paso, Galveston and Austin, the capital.

Surface and Drainage. In general, the surface of Texas consists of a series of extended plains and plateaus more or less diversified by mountains and hills, and sloping gradually from the northwest to the southeast.

The state is divided into four physiographic regions. The first region, belonging to the coastal plain, extends inland from 100 to 200 miles and is prolonged northward to the northeastern corner. This region rises gradually from sea level to an altitude of 600 to 700 feet. The northern part of it is heavily timbered with long-leaved pine, short-leaved pine and hard woods. Second is the Great Black and Grand Prairie region, which lies to the west and northwest of the coastal plain. This region has an area of about 31,000 square miles and consists of a gently-undulating plain sloping toward the east and southeast, with an altitude of from 400 to 700 feet. The eastern part of this plain is nearly level, but in the west it is more broken, and that portion south of the Brazos River becomes rugged. It contains little timber, but is covered with a soil of remarkable fertility.

The third region is the great Staked Plain, or Llano Estacado, occupying the northwestern part of the state and bounded by high bluffs and buttes. This is a vast treeless plateau with an elevation of from 3,000 to 4,000 feet above sea level. It is in an arid region, but a large part of its supports a good growth of grass, and the region is well adapted to grazing. The fourth, the mountainous region, occupies the western part of the state between the Pecos and Rio Grande. This contains a continuation of the Rocky Mountains, which extend southward into Mexico. The elevations vary from 3,000 to 6,000 feet and some of the highest peaks have an elevation of 9,000 feet.

The rivers of Texas flow into the Mississippi, the Gulf of Mexico or the Rio Grande,

the latter forming the boundary between the state and Mexico. The principal tributary of the Mississippi from Texas is the Red, which forms a part of the northern boundary and drains the northeastern corner of the state. The Sabine, forming a part of the boundary between Texas and Louisiana, drains a small portion of the eastern section and flows directly into the Gulf. The other streams of importance flowing into the Gulf, in their order southward from the Sabine, are the Neches, the Trinity, the Brazos, the Colorado and the Nueces. The principal tributary of the Rio Grande is the Pecos, which flows across the western part of the state. Along the coast there are numerous lagoons enclosed by low sand bars, and in a number of places there are deep indentations, the most important of these being Sabine Lake, Galveston Bay, Matagorda Bay and Corpus Christi Bay.

Climate. On account of its size and its relief, Texas has a variety of climate. The southern extremity is only 2° from the torrid zone, but the state stretches northward through 11° of latitude. It is mostly exempt from the extremes of cold and heat. The Gulf breeze blows from the southeast during the summer. The east part of the state is humid, with an annual rainfall of fifty to sixty inches. Toward the west it gradually diminishes, and at El Paso it is about ten inches. The Gulf coast and prairie region have abundant rainfall. The mean annual temperature is about 70°. One of the climatic features of the state is what is known as the "northers," which are stormy, northwest winter winds.

Mineral Resources. The value of the minerals produced in a year is approximately \$30,000,000, but the output of the mines by no means represents maximum production. Petroleum is the most valuable source of income, though the first field was not opened until 1894. Texas is now surpassed in oil production only by Oklahoma and California, and the yearly output is over 25,000,000 barrels. This is about one-fourth the output for Oklahoma; Illinois is a close competitor of Texas, and before 1915 was ahead of the Southern state. Texas petroleum is used both for lighting and for fuel, and the state has two other important sources of fuel, namely, coal and natural gas.

In the north and east-central parts there are extensive deposits of lignite and bitu-

inous coal; another area occurs along the Rio Grande between Laredo and Eagle Pass. The coal fields are about 63,000 square miles in extent, and are producing at the rate of about 2,000,000 tons a year. Texas is estimated to have a natural gas area covering 130 square miles. Its average annual yield is 13 billion cubic feet, and in this product it ranks eighth among the states.

There are valuable deposits of clay suitable for the manufacture of brick, sewer pipe, vitrified brick and pottery; the production of cement is another profitable source of income. Texas is a leading state in the production of quicksilver and of asphalt; the latter is derived chiefly from the heavy asphaltic oils found in abundance. Natural asphalt occurs in smaller quantities. Other minerals of commercial value include salt, gypsum, gold, silver, copper, lead, zinc, iron ore and cinnabar. Among the metals silver is of chief importance. The state possesses the largest artesian-well belt in the world, and there are numerous hot springs of medicinal value.

Agriculture. Texas has a more extensive area of cultivated land than any other state, and in value of crops it sometimes ranks first, though usually third—after Iowa and Illinois. Practically every crop adapted to a warm temperate climate can be grown in its fertile soil. The production of cotton is of chief importance, and in this line of agriculture Texas holds first rank among the states, its annual crop of more than 3,000,000 bales surpassing that of all British India. It raises about one-third the entire cotton crop of the United States. Over 11,000,000 acres are planted to cotton, and about 7,000,000 to corn, the most important cereal. The corn crop varies considerably, but in favorable years the harvest has reached 175,000,000 bushels. In the production of kafir corn Texas is equaled by no other state; it follows Louisiana in the output of rice, and Louisiana and Georgia in yield of sugar cane. Large crops of wheat, oats, potatoes, sweet potatoes, hay, alfalfa, tobacco, barley and rye are also raised, and berries, nuts and fruits of excellent quality are produced. Texas raises especially fine peaches, figs and pecans. Truck gardening and the sale of nursery products are among the special branches of agriculture to which much attention is given.

It is a leading livestock state, for it has extensive plains adapted to grazing. The cattle ranches are an important source of

supply for the great packing centers of the Middle West. Horses, mules, cattle, sheep and hogs are raised in great numbers, and their total value is over \$400,000,000.

In sections of limited rainfall irrigation is an important factor in agricultural development. A Federal reclamation project serves the arid region along the upper course of the Rio Grande, and in the artesian-well belt there are several private systems using water obtained from the wells. The water of the Lower Rio Grande is also utilized. A state board of engineers manages the water resources.

Manufactures. Texas possesses great natural advantages for manufacturing in its wealth of raw material and supply of cheap fuel. The large area of the state and the heavy freight charge tend also to encourage the manufacture of articles for local use. The milling of flour, slaughtering and meat packing and the manufacture of lumber and of timber products are the leading industries. Next in importance is the making of cottonseed oil and cake, in the value of which Texas ranks first in the Union. Other industries are rice polishing, sugar refining, the making of molasses, the manufacture of clay products, cotton goods, saddles and harness, the making and repairing of railway cars and the canning of fruits and vegetables.

Transportation and Commerce. Galveston, the chief seaport, is the leading cottonshipping port in the world, and ranks next to New York and New Orleans as an export and import center. The northeastern and central parts of the state are well supplied with railways. Two trunk lines extend across the state from northeast to southwest into Mexico, and two lines cross it from east to west, reaching the Pacific coast. These are connected by numerous cross-lines and also have spurs reaching the lumber regions and the most important agricultural sections, but several of the coast counties and those in the northwestern and western parts of the state are yet without adequate railway communication. The entire mileage of the state is about 15,700, which places Texas the first state in the Union in railway mileage. There are nearly 10,000 miles of surfaced roads, and about 1,000 miles of interurban lines.

The commerce of Texas is extensive. The exports consist of cotton, lumber, oil, rice, hardware, livestock, wool, vegetables and fruits, and far exceed in value the imports,

which consist of manufactured goods and food products.

Government. The legislature consists of a senate limited to thirty-one members, and a house of representatives limited to not more than one member to each 15,000 inhabitants and not more than 150 members in the aggregate. The senators are elected for four years; the representatives, for two years. The legislature meets biennially and the session is practically limited to sixty days by the reduction of pay of the members after that time. The executive department consists of a governor, lieutenant-governor, secretary of state, adjutant-general, comptroller, treasurer, commissioner of agriculture, commissioner of insurance, state superintendent of public instruction and attorney-general.

The courts consist of a supreme court of three judges, elected for six years each, five courts of civil appeal, of three judges each, one court of criminal appeals of three judges, and sixty-three district courts of one judge each; also county courts of each county, and justice courts for precincts, towns and villages. The judges of the district courts are elected for four years; those of the county courts for two years.

Education. The state maintains an excellent system of public schools and has the largest permanent school fund in the Union. The perpetual state funds amount to about \$83,000,000, the exact value and the exact distribution varying from time to time. Separate schools are maintained for white and colored children. The school system is under the direct supervision of a board of education and a state superintendent. In each county of 3,000 school population and over there is a county superintendent of schools. In smaller counties the people may, by vote, establish this office. When there is no such officer, the county judge is ex-officio the county superintendent of schools. Besides the rural schools, cities and large towns are independent school districts and have, in many instances, excellent systems of graded schools.

State normal schools are located at Huntsville, Denton, San Marcos and Canyon City. There is also a state normal school for colored teachers at Prairie View, near Hempstead. The state university is at Austin, but its medical department is at Galveston. The agricultural and mechanical college is at College Station, near Bryan, and the college

Items of Interest on Texas

The great Galveston flood was directly responsible for the establishment of the commission form of government in American cities. Immediately following the flood, great disorder prevailed and a committee of citizens was named to exercise, temporarily, absolute control of the city's interests. This centralization of authority was so satisfactory that the commission form was made a permanent feature of Galveston's government, and rapidly spread to other cities.

The Panhandle is the projection northward between New Mexico and Oklahoma. Guadalupe Peak, 9,000 feet high, in the central western part, is the highest elevation in the state.

Originally great herds of bison roamed over the Texas plains, and deer, bear and wolves were numerous; to-day most of the large animals have been exterminated, but there still remain many smaller ones, especially Louisiana, black and cinnamon bears, coyotes or prairie wolves, prairie dogs, jack rabbits, raccoons, squirrels, opossums, skunks, jaguars, cougars and lynxes.

Snakes of many different species, especially rattlesnakes, are found in all parts of the state.

San Antonio has as its most interesting building the historic Alamo, originally a chapel, made famous in the Texan War of Independence. San Antonio is now a great commercial and manufacturing center.

Houston is the most important railway and shipping point in the southern part of the state and has a large trade in cottonseed oil, sugar, rice and lumber; its factory products are almost exclusively made from raw materials of the surrounding region.

Dallas, the principal manufacturing center of the state, is also a shipping center for a wheat, fruit and cotton-raising district, and is the most important distributing point for agricultural machinery in the southwest; it is a live-stock market and one of the chief centers in the United States for the manufacture of saddlery and leather goods.

Galveston is important chiefly as a commercial port: it is second only to New York in the value of its exports; it is the greatest cotton-exporting city in the Union, the annual exports being over \$160,000,000. It is also famous for the introduction of the commission form of municipal government.

Fort Worth, like Galveston, Dallas and Houston, has the commission form of government. It lies in the midst of a stock-raising and farming region; among the manufactured products are packed meats, flour, beer, trunks, mattresses, woven wirebeds, furniture; there are also foundries, rolling mills and tanneries.

Austin, the state capital, is the principal trade center for central and western Texas, is an important market for live stock, cotton, grain and wool, and has extensive manufactures, including flour, cottonseed oil, leather goods, lumber and woodenware. It is the seat of the University of Texas and of many other educational and charitable institutions. It adopted the commission form of government in 1909.

Waco is the commercial center for an agricultural region and also has manufactures valued at \$3,000,000 a year.

Texas is six times as large as the state of New York.

Questions on Texas

What is the area of Texas? How does it compare with other states?

What are its physical divisions?

What is the Panhandle?

Name the principal rivers. What sections do they drain?

What wild animals are still common?

In the production of what crop does Texas lead the Union?

What are some other important crops?

How does it rank in production of cottonseed oil?

What is the railway mileage of the state?

What is the Alamo and why is it famous?

Describe briefly the Galveston or commission form of municipal government.

of industrial arts (for girls) is at Denton. There are besides these institutions a number of important colleges and secondary schools under private or church control. The most important of these are the following:

Asgard College (for women) at South Houston.

Austin College (for men) at Sherman.

Baylor University at Waco.

Howard Payne College at Brownwood.

North Texas Female College at Sherman.

Polytechnic College at Fort Worth.

Saint Louis College (for men) at San Antonio.

Simmons College at Abilene.

Southwestern University at Georgetown.

Texas Christian University at Fort Worth.

Trinity College at Waxahachie.

Westminster College at Tehuacan.

Institutions. The charitable and correctional institutions include the state penitentiaries at Huntsville and Rusk, insane hospitals at Austin, Terrell and San Antonio, a state orphans' home at Corsicana, a state epileptic colony at Abilene, a deaf and dumb institute at Austin, a Confederate soldiers' home, Confederate women's home, and a deaf, dumb, and blind institute for colored youths at Austin, a state juvenile training school at Gatesville, a state tuberculosis sanatorium at Carlsbad, and a girls' training school at Gainesville.

History. Cobeza de Vaca, a Spanish companion of Narvaez, visited Texas in 1528, but it was more than one hundred fifty years later that the first European settlement was made by La Salle. Many years later missions were founded by Spaniards at San Antonio. In 1730 the Indians began war on both French and Spaniards, but did not weaken the hold of either. After 1820 there was a vast immigration of citizens of the United States to Texas, the most important settlement being made at Austin. At about the same time the revolt of Mexico from Spain occurred, in which the Texans eagerly joined, but oppressive laws by the Mexican congress led to a revolt of Texas from Mexico, under the leadership chiefly of Americans, among them Sam Houston. Texas was successful in gaining its independence, though the fact was never recognized by Mexico. A republic was formed which was disorganized in 1845, when Texas was annexed to the United States and admitted as a state. This led to the Mexican War, which was terminated by the Treaty of Guadalupe Hidalgo, by which Mexico conceded the United States' demands.

In 1861 the state seceded from the United States and joined the Confederacy, to whose armies it furnished 90,000 soldiers during the Civil War. Under orders from President Johnson in June, 1865, a reorganized government was established, with a constitution abolishing slavery, renouncing the right of secession, conferring civil rights on freedmen and repudiating the Confederate state debt. However, Congress did not recognize the new government, and by the reconstruction acts of 1867 placed the state under military authority, with General Philip H. Sheridan in command. Until 1870 the carpetbag régime ensued, with disastrous results, but on March 30th of that year Texas was readmitted to the Union. Since then the state has enjoyed a prosperous development. A disastrous tidal wave nearly destroyed Galveston in 1900, but the damage was speedily repaired, and a sea wall and causeway were constructed to prevent another similar disaster. Of late years many progressive laws have been passed, including workmen's compensation and mothers' pension acts. In 1919 the people voted in favor of state prohibition and rejected a woman suffrage measure.

Related Articles. Consult the following titles for additional information:

CITIES

Abilene	Denison	Paris
Amarillo	El Paso	San Angelo
Austin	Fort Worth	San Antonio
Beaumont	Galveston	Sherman
Brownsville	Greenville	Temple
Cleburne	Houston	Texarkana
Corpus Christi	Laredo	Tyler
Corsicana	Marshall	Waco
Dallas	Palestine	Wichita Falls

HISTORY

Alamo	Houston, Sam
Guadalupe Hidalgo, Treaty of	Louisiana Purchase Mexican War

RIVERS

Brazos	Pecos	Rio Grande
Canadian	Red	Sabine
Colorado		

TEXAS, UNIVERSITY OF, a state institution of higher learning, established at Austin, Tex., in 1876, but not opened until 1883. As organized it comprises a college of liberal arts and departments of engineering, education, law and medicine, the last being located at Galveston. A system of university extension courses is a successful and popular part of the organization. The income of the university is derived from a million and a half acres of land, set apart by the state. The faculty numbers nearly 200, and there are about 2,500 students. The library contains 130,000 volumes.

TEXTILE, *tex'til*, a woven fabric and the articles of clothing made from it, also the material suitable for weaving into the fabric. In a commercial sense, the term includes knit goods, felt, carpets and rugs. In the United States the textile industry, including the manufacture of clothing, is second only in importance and value to the steel industry. It gives employment to over 1,000,000 people, and the total value of its annual output is about \$1,750,000,000. The value of the output in Canada is about \$150,000,000. In England and Ireland the manufacture of textiles is the leading industry.

The manufacture of textiles did not become a separate industry until about 1800. Before that time each housewife spun the yarn, wove the cloth and made the clothing for the family. Later certain families in the neighborhood devoted their time to making cloth. Then came the invention of the spinning jenny by Hargreaves and the power loom by Cartwright, which completely revolutionized the textile industry, by making possible the factory system of the present time.

THACKERAY, WILLIAM MAKEPEACE (1811-1863), one of the greatest of English novelists, born July 18, 1811, in Calcutta, where his father was a collector of revenues. At the age of seven he was sent to England for his education, was placed at the Charterhouse School, London, and afterward continued his studies at Cambridge. He left the university without taking a degree and chose the career of an artist; but after spending some time in study at Paris, he became convinced that art was not his vocation, and having lost his fortune, he resolved to turn his attention to literature.



WILLIAM M.
THACKERAY

His first appearance in this sphere was as a journalist. Under the names of George Fitz-Boodle, Esq., or of Michael Angelo Titmarsh, he contributed to *Frazer's Magazine* tales, criticisms, verses and character sketches which were marked by extraordinary knowledge of the world, keen irony and playful humor. It was in this magazine that *The*

Yellowplush Papers, *Barry Lyndon*, *The Paris Sketchbook* and *The Irish Sketchbook* first appeared. In 1841 *Punch* was started, and Thackeray's contributions to that periodical, among others *Jeames's Diary* and the *Snob Papers*, brought him a measure of fame.

In 1836 Thackeray married Miss Isabella Shawe. Of his three daughters, one died in infancy, and in 1840 Mrs. Thackeray became hopelessly insane. Thackeray set himself to work much harder, and in 1846-1848 appeared, serially, his first great novel *Vanity Fair*, an incomparable picture of the snobishness and vulgar social climbing in the English upper class life of the time. Long before it was completed the author was unanimously placed in the front rank of British novelists. After *Vanity Fair* appeared *Pendennis*, a novel partly autobiographical; *Henry Esmond*, an accurate representation of eighteenth-century life in England, by some critics considered the greatest of English novels; and *The Newcomes*.

Thackeray made two lecture tours in the United States, the first in 1852, on *The English Humorists of the Eighteenth Century*, and the second, three years later, on *The Four Georges*. Subsequently he became editor of the *Cornhill Magazine*, in which was first published his *Lovel the Widower*, *The Adventures of Philip* and *The Roundabout Papers*. *The Virginians*, a short sequel to *Henry Esmond*, was published in 1857, and *Denis Duval*, his last novel, was left unfinished.

Thackeray's writings are remarkable always for their unflinching purity and simplicity of style. They are characterized throughout by keen satire, though they are never bitterly cynical. He ridicules sham and pretense in whatever guise, and is always quick to see what is good and genuine. Thackeray undoubtedly ranks as the foremost English satirist of the Victorian period and as one of the greatest novelists, essayists and critics in the literature of his country. His verse, half humorous, half pathetic, and often wholly extravagant, is always characterized by grace and spontaneity.

There is no important biography of Thackeray, but Trollope's *Thackeray*, in the English Men of Letters Series, gives interesting light on his life and ideas.

THALES, *thay'leez*, the earliest philosopher of Greece, and founder of the Ionian School of Philosophy, was probably born at

Miletus, about 624 B. C. He traveled and studied in Crete, Phoenicia and Egypt, and on his return became known as one of the seven wise men of Greece. He left no writings, but his sayings—among them the famous “know thyself”—became axiomatic and were handed down orally from generation to generation until Aristotle committed them to writing several hundred years after Thales’ death. Thales’ two famous pupils were Anaximander and Anaximenes.

THALIA, one of the nine Muses. She was the patron of comedy and pastoral poetry and was usually represented with the comic mask and the shepherd’s crook in her hand. One of the Graces was also called Thalia.

THALLIUM, a metallic element discovered in 1861 by Sir William Crookes. In its physical properties thallium resembles lead, but it is slightly heavier, somewhat softer and may be scratched by the finger nail. It melts under a red heat and is soluble in the ordinary mineral acids. In color it resembles silver, but is less brilliantly white. The tenacity of the metal is less than that of lead, but it is possessed of very considerable malleability. The compounds of thallium are exceedingly poisonous. Small quantities of thallium appear to be widely distributed in nature, the metal frequently occurring in natural sulphides.

THALLOPHYTES, *thal’o fites*, one of the four divisions of plant life, including the algae and fungi. Most thallophytes have thallus bodies, that is, their structure is not differentiated into such organs as stem, leaves, etc.,. See **ALGAE**; **FUNGI**.

THAMES, *temz*, the most important, though not the largest, river of Great Britain. It rises in Gloucestershire and, flowing in a general eastward direction, separates the counties of Wilts, Berks, Surrey and Kent on the south, from Gloucester, Oxford, Buckingham, Middlesex and Essex on the north. About sixty miles below London, through which it passes, it enters the North Sea, through an estuary twenty-seven miles wide. Other cities on its banks are Oxford, Reading, Maidenhead, Windsor, Chertsey and Kingston. The entire length of the river is 217 miles. It is navigable about 180 miles for light craft, and for sea-going vessels to London, where there are very extensive docks, extending for miles. It is connected by canal with the Severn. The Medway is the longest tributary.

THAMES RIVER, BATTLE OF THE, a battle fought on the Thames River, in the township of Oxford, Ontario, Canada, October 5, 1813, between a force of about 3,000 Kentucky volunteers, under General William Henry Harrison, and a British force of about 650 under General Proctor, aided by about 2,000 Indians under Tecumseh. The battle was opened by a famous cavalry charge led by Colonel Richard M. Johnson, who, it is said, personally killed Tecumseh. After retreating before General Harrison for several days, Proctor made a stand. The battle practically put an end to Indian coöperation with the British in the northwest.

THANE, a title of honor among the Anglo-Saxons. In early England a freeman who was not a noble might become a thane by acquiring a certain acreage of land, by making three sea voyages, or by taking holy orders. The title passed to his sons. The thane had the right to vote on important questions in the local and national assemblies. The title disappeared in England after the reign of Henry II.

THANET, OCTAVE. See **FRENCH, ALICE**.

THANKS’GIVING DAY, in the United States, an annual festival of thanksgiving for the blessings of the closing year. It is fixed by proclamation of the President and the governors of states, and ranks as a legal holiday.

The earliest harvest thanksgiving in America was kept by the Pilgrim Fathers at Plymouth in 1621, after the gathering of the first harvest, when Governor Bradley made provision for a day of thanksgiving and prayer. This custom was repeated often during that and the ensuing century. Congress recommended days of thanksgiving annually during the Revolution, and in 1784 for the return of peace. President Madison issued a proclamation of the same import in 1815. Washington appointed a similar day in 1789, after the adoption of the Constitution, and in 1795 he appointed another day as Thanksgiving Day for the general benefits and welfare of the nation. Since 1863 every President has issued each year a proclamation appointing the last Thursday of November as Thanksgiving Day.

THEATER, a building erected for the purpose of presenting dramatic or other spectacles.

Ancient Theaters. The first theaters of the Greeks, who were the founders of the

drama in its modern sense, were very rude structures. They were usually temporary wooden scaffolds, but in 500 B. C., an accident occurred, and in that same year the Athenians set to work to build the great theater of Dionysus, the first stone structure of the kind. Ruins of theaters exist in almost every city of Greece, and they all show similarity to this first theater in Athens. Among the Greeks and Romans, theaters were the chief public edifices next to the temples, and in point of magnitude they surpassed the most spacious of the temples, having in some instances accommodation for as many as 10,000 to 40,000 spectators.

The Greek and Roman theaters very closely resembled each other in their general form and principal parts. The building was of a semi-circular form, resembling the half of an amphitheater, and it was not covered by a roof. In Greece the semicircular area was often scooped out in the side of a hill, but Roman theaters were built on the level. The seats of the spectators were arranged in tiers up the semicircular slope. The part of the theater in which the spectators sat was usually called the *cavea*, or pit, because it was excavated, and this name is still applied to the lowest part of the audience room in a modern theater.

The stage, or place for the players, a narrow platform along the straight side of the theater, was in front of the seats. Behind this rose a high wall, resembling the façade of a building, this being intended to represent any building in front of which the action was supposed to take place. This was called in Greek *skēnē*, the stage being called *proskēnion*. The semicircular space between the stage and the lowest seats of the spectators was called *orchestra* and was appropriated by the Greeks to the chorus and musicians, and by the Romans to the senators. Scenery, in the modern sense of the word, was not employed, except in a very rude form, but the stage machinery seems in many cases to have been elaborate; and in particular there was a well-known machine or contrivance of some sort, from which deities made their entrance, as if from the sky.

The immense size of the ancient theaters made it impossible for the unaided voice to be heard by the whole audience. To remedy this, the actors wore metallic mouthpieces very similar to megaphones. In comedy the actors wore a light shoe, called the *sock*, a

term often used to designate comedy, in contradistinction to tragedy, in which a *buskin* or high-heeled shoe was worn by the actor, to make him appear taller. The actors were males, the characters of women being represented by young men. The performances, which always included a series of plays, often lasted from sunrise until sunset. A price was charged for admission until the time of Pericles, when the poorer classes, and later all the citizens, were admitted at the cost of the State. In earlier times women were allowed to witness the tragedies only, but later they attended all representations.

Medieval and Early Modern Periods. Between the decline of the ancient, and the rise of the modern, drama there is a long interval, in which the nearest approach to theatrical entertainments is found in miracle plays, mysteries and interludes. These performances took place in churches, convents or halls or in the open air. Sometimes the stage was roofed, in which case the ends of it were used by the fashionable patrons, an arrangement which later gave rise to the use of boxes.

In 1548 the Confraternity of the Trinity opened a theater in Paris, in which secular pieces were performed. The first theater erected in Italy seems to have been that of Florence, built in 1581, but the first building that approaches the modern style was one constructed at Parma in 1618. In England there were organized companies of actors as far back as the time of Edward IV; but as there were no regular playhouses, the performances took place in tennis courts, inn yards and private houses. The London Theater was built by James Burbage before 1576, and the Curtain in Shoreditch and the playhouses in Blackfriars and Whitefriars date from about the same time. Shakespeare's plays were brought out at the house in Blackfriars and at the Globe on the Bankside, both of which belonged to the same company, to whom James I granted a patent in 1603. The Globe was a six-sided wooden structure, partly open at the top and partly thatched. Movable scenery was first used on the public stage by Davenant in 1662, and about the same time this manager introduced women to play female characters, hitherto taken by boys and men.

Theaters of To-day. Present-day theaters are elaborate structures. The auditorium, usually in horseshoe shape, is highly deco-

rated and has sloping floors, from one to four balconies, boxes and orchestra. The stage is extensive in size, with adjuncts of curtain, "flies," lighting arrangements and dressing rooms. The shifting of the scenes requires a large number of men.

Since the disastrous Iroquois Theatre fire in Chicago, in 1903, in which 572 persons perished, strict regulations have been enforced in most countries as to the number and accessibility of exits and the separation of the auditorium from the stage by an asbestos or sheet-iron curtain.

Mechanical devices and the use of electricity for power and lighting make possible almost any scenic effect on the modern stage. These, together with the literary genius that has been thrown into dramatic writing in the past fifty years, have raised the theatre when at its best to one of the most cultural and educational influences of our time. All the other arts are enlisted in the production of the drama.

Moving Picture Theatre, an auditorium for the display of moving pictures, commonly a rectangular room with a curtain at one end, upon which the pictures are thrown. Some moving picture theatres, however, are very elaborately decorated and are furnished with permanent facilities for music. In some cases, also, theatres built for the legitimate play are adapted to the use of moving picture performances during the summer months.

Related Articles: Consult the following titles for additional information:

Colosseum Drama Moving Picture

THEBES, *theebz*, EGYPT, ancient capital of the country and for centuries the seat of government of the Pharaohs. It is situated in Upper Egypt, on both sides of the Nile, about 300 miles southeast of Cairo, and is now represented by the four straggling villages of Luxor, Karnak, Medinet Habu and Kurach, as well as by the most impressive ruins of antiquity, extending about seven miles along the river.

The city reached its period of greatest prosperity from 1500 to 1000 B.C. The ruins comprise magnificent temples, rock-cut tombs, obelisks decorated with beautiful sculptures, long avenues of sphinxes and colossal statues. The largest of the temples is that at Karnak. Above Karnak are the village and temple of Luxor. The Memnonium, or temple of Rameses II, the temple and palace of Rameses III, and the colossal statues of Amenoph III, one of them known

as the vocal statue of Memnon, are of great historical interest. In the interior of the mountains which rise behind, are found tombs of the kings of Thebes, excavated in the rock, the most remarkable being that of Seti I, discovered by Belzoni, and containing fine sculptures and paintings.

THEBES, GREECE, a celebrated ancient city, at one time the supreme power in Greece, is situated about forty miles north of Athens and about midway between Mount Helicon and the channel separating Euboea from the mainland. The cycle of legends associated with Thebes is almost as famed as that identified with Troy. It was the chief city of Boeotia, and the birthplace of Pindar, Epaminondas and Pelopidas. It is said to have been founded by Cadmus, 1500 B. C. Under the leadership of Epaminondas it became the most important city and state of Greece; this supremacy came to an end with his death in 362 B.C. Under Roman rule it again became prosperous, but declined under the Turks. The present village is of little importance; it has a population of approximately 3,500.

THEINE, *the'in*. See CAFFEINE.

THEMES, OUTLINES FOR. The selection of material is the first step in writing an essay. The second step is arranging that material so that the composition, when completed, will read smoothly and have an orderly development. There is no better way of securing smoothness and order in an essay than by making an outline before beginning to write. The outlines which follow will suggest to teachers and pupils how the different types of essays may be planned. Attention is also called to the numerous outlines scattered throughout these volumes.

Descriptive Themes

THE RAINBOW

What it looks like

An arch across the sky

Its different colors

Where its ends seem to rest

Made up of two bows

A brighter and a fainter bow

How they differ in color arrangement

Where the rainbow is always seen

In that part of the sky opposite the sun

The higher the sun, the lower the bow

Why?

No bow visible when the sun is above 40°

Is there another side to the bow?

The reason for the rainbow

Reflection and refraction of the sun's rays

falling on raindrops

Why there are seven colors

Who first correctly explained the rainbow?
 Where small rainbows may be seen
 In the spray of waterfalls
 In the soapbubble
 The Bible story of the bow
 Told in Genesis, Chapter IX
 What sailors say about it
 Rainbow at night, sailors delight;
 Rainbow in the morning, sailors take
 warning.

THE OAK

The monarch among forest trees
 Symbol of strength and sturdiness
 Its defiance of time and tempest
 What it looks like
 Wide-spreading branches
 Bears two kinds of flowers
 Beauty of its leaves
 How it grows
 From small seeds called acorns
 Acorns used as food in some countries
 Meaning of the proverb, "Tall oaks from
 little acorns grow"
 Uses of the oak
 Wood valuable in carpentry because of its
 beauty, durability and strength
 Bark used in tanning and dyeing
 Shade and ornamental tree
 The oak in history
 Chaplet of oak leaves a token of honor worn
 by Roman soldiers
 Sacred oaks of the Druids in Britain
 Charter Oak of Connecticut
 The oak in literature
 The Forest Hymn, by Bryant; The Oak, by
 Lowell; A Song of the Oak, by Chorley.

A SNOWSTORM IN THE COUNTRY, BASED ON
WHITTIER'S "SNOWBOUND"

First signs of the coming storm
 Dark circles about the noonday sun
 Afternoon sun hidden by threatening clouds
 Rising of a bitterly cold wind
 The storm in its fury
 The snowflakes in a wild dance
 Drifts pile against the window frame
 Storm rages all night and the next day
 The day after the storm
 The blue sky above a universe of snow
 What the snow-covered farm structures
 look like
 Farmer summons the boys to dig paths
 Tunneling through the drifts
 Rescuing the barn animals from a hunger
 siege
 The farm that evening
 Beauty of the snow-covered hills in the
 moonlight
 Contrast between snow and dark hemlock
 trees
 The snow-bound farm folk
 Around the evening hearth fire
 The feast of cider, apples and nuts
 Stories of days gone by

ABOUT LEAVES

Parts of a typical leaf
 Blade, or flattened part of the leaf
 Petiole, or stem of the leaf
 Stipules, or expansions at base of petiole

What the leaf is made of
 Upper and lower surfaces of membrane,
 called epidermis
 Breathing pores in epidermis, called sto-
 mata
 Layers of cells between the surfaces
 Leaf green, or chlorophyll, found in certain
 cells
 Threads of fiber, forming ribs and veins
 What the leaves do
 Manufacture sugar and starch to feed the
 plant
 Act as lungs for the plant
 Send into the air surplus water taken from
 the sap
 Fallen leaves make a deep carpet that pro-
 tects the roots of trees from frost
 Why the leaves fall
 Their food materials are absorbed by the
 branches and roots, to be stored through
 the winter, and so they wither and fall off
 Why the leaves turn red and yellow in au-
 tumn
 Because of chemical changes in the cells
 Jack Frost is not the painter of the leaves

Narrative Themes

A DISCARDED DOLL SPEAKS ON A CHRISTMAS DAY

My appearance
 I have lost one eye and an arm
 The sawdust has oozed out of one leg
 My nose is broken off
 I have no hair
 I am wrapped in an old piece of cloth
 My home and companions
 I live in a dark corner in an attic
 My companions are a broken tin soldier, a
 woolly lamb with one leg gone, and a
 head-less doll
 How I came to this sad condition
 My little mistress grew tired of me
 She gave me to her little brother
 He "banged" me around
 At housecleaning time I was cast aside
 My former state
 I was a loved and welcomed gift last Christ-
 mas morning
 My hair was curly and I was beautifully
 dressed
 My little mistress showered me with kisses
 My decline
 A rival doll appeared
 I was no longer treated with respect after I
 lost my eye
 Little brother's treatment broke my heart
 Moral
 Dolls should form a union to protect their
 rights

STORY OF THE AMERICAN FLAG

Colonial flags of 1775 and 1776
 "Conquer or die," standard of Concord
 Pine-tree flag of Bunker Hill
 Grand Union flag of 1776, unfurled at Cam-
 bridge
 First national flag
 Adopted by Congress on June 14, 1777
 Thirteen stripes and thirteen stars
 First flag made by Betsy Ross
 Stars and Stripes float above Fort Stanwix
 in August, 1777

Flag of fifteen stripes and fifteen stars
 Adopted on admission of Vermont and Kentucky, 1795
 Floats over Fort McHenry in 1814, inspiration of national anthem, The Star-Spangled Banner
 Congressional act of 1818
 Provided for a flag of thirteen stripes
 Each state is to be represented by a star
 Starry field has now forty-eight stars
 What the flag stands for

THE PIED PIPER OF HAMELIN
 (Based on Browning's Poem)

Hamelin town in Brunswick
 A pleasant town on the river Weser
 The pest of rats
 Petition of the people
 Mayor and Corporation threatened
 The entrance of the Pied Piper
 Proposition made by the Piper
 To free the town of rats
 To be paid 1,000 guilders
 The Piper blows his pipe
 The rats by thousands come tumbling out of the houses
 They follow him to the river
 The rejoicing of the people
 The Piper demands his pay
 Refusal of the Mayor
 The Piper's revenge
 The town children are enticed to the mountain
 The mountain swallows them all
 Lamentations of the lame boy left behind

STORY OF THREE BUTTERFLIES

Who the butterflies were
 A white, a red and a yellow one
 What they were doing
 Playing in the sunshine
 Dancing from flower to flower
 It begins to rain
 Their wings get wet
 The door of their house is locked
 Their appeal to the red and yellow tulip
 The tulip refuses to shelter the white butterfly
 The red and yellow ones will not desert her
 They fly to the lily
 The lily will shelter only the white one
 The white one will not desert her sisters
 The sun is pleased
 He drives away the rain
 The wings of the butterflies dry
 They dance again in the garden

Expository Themes

ON THRIFT

What is thrift?
 Being saving of
 Money, time, health, energy
 Being careful in little things
 Overcoming negligence and forgetfulness
 The moral value of thrift
 It disciplines the character
 It develops self-control
 It trains the will
 It helps one form good habits
 The practical value of thrift
 It enables one to save money

It is preparation for a rainy day
 The thrifty are always well provided for
 They need not fear sickness or old age
 They can help good causes
 Who should practice thrift :
 The individual
 The family
 The nation

ON PATRIOTISM

What is patriotism?
 Love for country
 A universal feeling
 How true patriotism is expressed
 In time of peace
 By obeying the law
 By working for better laws
 By voting intelligently
 By making sacrifices for the public good
 By observing national holidays
 In time of war
 By consecrating to one's country
 Time, money, service, life itself
 By bearing burdens cheerfully
 By honoring the flag
 By being loyal in word, thought and act
 Examples of true patriots
 Joan of Arc
 Horatio Nelson
 Garibaldi
 Nathan Hale
 Abraham Lincoln

GOOD HEALTH

The blessings of health
 Adds to the enjoyment of life
 Increases efficiency
 Insures long life
 Adds to happiness of others
 How health is maintained
 Food and drink
 Choice of nourishing, simple foods
 Avoidance of tobacco, liquor and highly seasoned foods
 Moderation in use of sweets, tea and coffee
 Exercise and breathing
 Daily exercise in fresh air
 Cultivation of outdoor games and sports
 Deep breathing exercises
 Rest and recreation
 Regular sleep in ventilated room
 Avoidance of over fatigue
 Mental relaxation—music, reading, etc.
 Avoidance of dissipation and late hours
 Cleanliness
 The daily bath
 Care of teeth, nails and hair
 Sanitary surroundings
 Clean clothing

BASKET BALL

The field
 Average dimensions
 How marked off
 Suspended basket nets for goals
 The ball
 Inflated bladder in round leather case
 Dimensions and weight
 Two teams consisting each of
 One center

Two forwards
 Two guards
 The game
 Played in two halves
 Intermission of ten minutes
 Winning side makes the most baskets

Scoring
 A basket counts two points
 Free throws

Rules
 Position of players
 Their duties
 Fouls

Why basket ball is beneficial

It develops
 Alertness
 Self-control
 The muscles
 Good sportsmanship

It can be played
 Indoors and outdoors
 By either sex

Argumentative Themes

WOMEN SHOULD HAVE THE VOTE

To restrict the vote to men is unjust
 It is not fair to class women with criminals, idiots and the insane

Tax-paying women should have a voice in legislation

Women as a whole are as deserving of suffrage as men

To deprive them of the vote is contrary to the principles of democracy

Woman suffrage would benefit the state

Women have keener convictions than men on moral issues

As a rule they will vote for reforms

Example—they favor prohibition

Women would favor honest officials

Woman suffrage would benefit women themselves

Voting women would be aroused to greater interest in political and civil questions

They would work for better laws pertaining to the home, the school and social conditions

Woman suffrage has proved successful

It has been tried and been found a success in Denmark, Norway, Australia, New Zealand, Iceland, Canada and several states of the United States

THE SUMMER VACATION FOR SCHOOLS SHOULD BE ABOLISHED

The present system is wasteful

It is poor economy to have the schools idle for so many weeks

The time lost can never be regained

The long vacation has a bad effect on the pupils

They form idle habits

They lose in efficiency

They forget how to concentrate

It takes a long time to overcome this slackness

Proposed remedy

Division of year in four terms, and each term into halves

School the year round

Six-weeks vacation as needed

Advantages of new plan

Pupils can complete school course in shorter time

Those who leave school early to go to work are better prepared than under old plan

Gain in economy and efficiency

CAPITAL PUNISHMENT SHOULD BE ABOLISHED

Capital punishment is contrary to the moral code

The taking of a life should be left to Providence

No government should assume the responsibility of sending a soul to eternity

Capital punishment is unnecessary

Imprisonment for life serves the purpose of:

Punishing the criminal

Protecting society

Capital punishment has evil effects

It lowers the public sense of the sacredness of life

The publication of the details of an execution are revolting

Capital punishment tends to thwart the ends of justice

Many jurors would prefer to acquit a man than to sentence him to death

Capital punishment is unsound in theory

It does not aim to reform the criminal

It exalts the idea of revenge

The revenge idea tends to arouse antagonism and to encourage crime

Prison reform should be substituted

It is more humane

It may make a good man out of a criminal

It is the only enlightened method of punishment

Capital punishment has been outlawed in many countries

Many great thinkers have been opposed to it.

MILITARY TRAINING IN HIGH SCHOOLS IS DESIRABLE

Military drill is healthful

It develops the muscles

It straightens the shoulders

It expands the chest and lungs

Such training is morally beneficial to the individual

It increases mental alertness

It is a splendid form of discipline

It encourages self-respect and obedience

Military training of youth is a benefit to the nation

It provides the foundation for national defense

High school drill is preferable to universal military service.

It does not interfere with industry

It gives training to growing youths

THEMIS, goddess of law and justice among the Greeks, the daughter of Uranus and Gæa (Heaven and Earth) and one of the wives of Zeus and the mother of the Horae (Hours) and Moerae (Fates).

THEMISTOCLES, *the mis'toh kleez* (about 514-449 B. C.), one of the most celebrated of Athenian generals and statesmen, who won his greatest victory at the age of

thirty and by his naval policy at that time laid the foundation for future Athenian supremacy. After the Battle of Marathon, 490 B. C., he convinced the Athenians, most of whom believed that the struggle with Persia was over, that there was still need for preparation, and he induced them to build a fleet. On the invasion of Greece by Xerxes, Themistocles succeeded in obtaining the command of the fleet, and in the Battle of Salamis (480 B. C.) he conquered the Persians and saved Greece. Subsequently he was accused of having enriched himself by unjust means and of being privy to designs for the betrayal of Greece to the Persians. Fearing the vengeance of his countrymen, after many vicissitudes he took refuge at the Persian court in 465 B. C. Some authorities assert that he committed suicide by taking poison, but there is no positive knowledge of it.

THEOCRACY, *the ok' ra sy*, literally, "government by God," the name given to a state in which God is regarded as the sole sovereign, and the laws of the realm are considered to be divine commands rather than human ordinances. The priesthood, therefore, become the interpreters of the "divine commands," act as the officers of the Invisible Ruler, and have authority as well in civil matters. The typical example of a theocracy is that established by Moses among the Hebrews. The governments of colonial Massachusetts and Connecticut were at times theocratic in nature.

THEODORIC, *the od' o rik* (about 454-526), king of the Ostrogoths, generally known as **THEODORIC THE GREAT**, founder of the Ostrogothic kingdom in Italy. He was born in Pannonia, and from his eighth to his eighteenth year he lived as a hostage with Emperor Leo at Constantinople. Upon the death of his father, in 474, Theodoric became chief ruler. In 488 he invaded Italy, defeated Odoacer and compelled the latter to grant him equal authority. The murder of Odoacer opened the way for Theodoric to have himself proclaimed sole ruler. He ruled with vigor and ability, abandoning war almost entirely. He introduced an improved administration of justice, and encouraged industry and the arts of peace. During his reign his country enjoyed a period of great prosperity. Although, like his ancestors, he was an Arian, he never violated the peace or privileges of the Catholic Church. See **GOths**, subhead *Ostrogoths*.

THEODOSIUS, *the o doh' she us*, the name of three Roman emperors, namely, Theodosius I, surnamed the Great (379-395); Theodosius II, emperor of the East from 408 to 450; Theodosius III, Byzantine emperor (716-717).

Theodosius I. was born in Spain. He was selected by the Emperor Gratian, in 379, as his partner in the empire. To his care were given Thrace and the Eastern provinces, which he delivered from an invasion of the Goths, concluding a peace with them in 382. On the defeat and death of Maximus, he became the sole head of the Empire, Gratian having been killed in the war against Maximus. In 390 a sedition took place in Thessalonica, and to satisfy his vengeance Theodosius caused the people of the city to be invited to an exhibition at the circus and then had them barbarously murdered, to the number, it is computed, of seven thousand. Saint Ambrose refused him communion for eight months on account of this crime, and Theodosius submitted humbly to the punishment. At his death he left the eastern portion of the Empire to his son Arcadius, the western to his son Honorius.

Theodosius II. was the only son and successor of Arcadius. During his reign the Empire was invaded by the Huns under Attila and a war was waged with Persia.

Theodosius III. was an unimportant Byzantine emperor who abdicated after a few months' reign.

THEOLOGY, *the ol' o jy*, the science which treats of the existence of God, his attributes and the divine will regarding human actions, present condition and ultimate destiny.

A sharp distinction was formerly drawn between *natural* and *revealed* theology. The former, or *philosophical theology*, relates to the knowledge of God from His works, by the light of nature and reason; the latter, or the *supernatural, positive, or revealed, theology*, sets forth and systematizes the doctrines of the Scriptures. With regard to the contents, theology is classified into *theoretical theology*, or *dogmatics*, and *practical theology*, or *ethics*.

As comprehending the whole extent of religious science, theology is divided into four principal classes: these are *historical*, treating of the history of Christian doctrines; *exegetical*, embracing the interpretation of the Scriptures and of Biblical criticism; *systematic*, arranging methodically the great truths of religion; *practical*, consisting, first of precepts and directions, as well as motives by which we should comply with them. *Apologetic* and *polemic* theology belong to several of these four classes at once. The

scholastic theology attempted to clarify and discuss all questions with the aid of human reason alone, putting aside the study of the Scriptures and adopting, instead, the arts of the dialectician.

THEOSOPHY, *the os'ofy*, according to its etymology, the science of divine things. However, the name is sometimes applied to the philosophy of those who, in their inquiries respecting God, have run into mysticism, as Jacob Böhme, Swedenborg, Saint Martin and others.

At the present day the term is applied to the tenets of the Theosophical Society, founded in New York in 1875 by Colonel Henry S. Olcott, the objects of which are (1) to form the nucleus of a universal brotherhood of humanity; (2) to promote the study of Eastern literature and science; (3) to investigate unexplained laws of nature and the psychical powers of man, and (4) to search after divine knowledge—the word divine meaning the true nature of the abstract principle, not the quality of a personal God. The theosophists assert that humanity is possessed of certain powers over nature which the narrower study of nature, from the merely materialistic standpoint, has failed to develop. Their so-called occult manifestations are akin to those attributed to spiritualism or telepathy, that is, communication between minds at a distance from each other.

Theosophical Society. Madame P. Blavatsky, a Russian, was the founder of the Theosophical Society, and her book, *The Secret Doctrine*, is the authoritative book on the modern philosophy. In 1878 she and Colonel Olcott left New York for India, where a system of propaganda was developed and numerous branches formed. Upon her death, she was succeeded by William O. Judge and Annie Besant, jointly. In 1895 the American section unanimously declared its autonomy as the "Theosophical Society in America," with Judge as its president; Annie Besant became head of the Esoteric Section, an inner body. In 1898 Katherine A. Tingley organized "The Universal Brotherhood Organization," and became absolute ruler. In 1916 Mrs. Besant was elected president of the parent society, with headquarters at Adyar, Madras, India.

THERAPEUTICS, *ther a pu'tiks*, that branch of medicine which treats of the discovery and application of remedies for

curing disease. In its broadest sense the term includes every form of treatment and, with a qualifying term, may be applied to any system of treatment. *Medical* therapeutics includes treatment by drugs; *electrical* therapeutics, by X-ray and other forms of the electric current; *general* therapeutics, treatment by dieting, massage, sunlight, etc; *mental* therapeutics, by suggestion and direction of the mental attitudes; *bacterial* therapeutics, treatment by serums, vaccination and antitoxins.

Related Articles: Consult the following titles for additional information:

Hydrotherapy	Pharmacopoeia
Massage	Röntgen Rays
Materia Medica	Surgery
Medicine	

THERE'SA, SAINT (1515–1582), a famous Carmelite nun and mystical writer, born at Avila, in Spain. She entered a convent of the Carmelites in 1534, where she remained for nearly thirty years.

She undertook to restore the original severity of the institute, and the first convent of reformed Carmelite nuns was founded at Avila in 1562. During the life of the founder, who took the name Teresa de Jesus in 1562, seventeen convents for women and sixteen for men accepted her reforms. She was canonized by Pope Gregory XV in 1622. Teresa was the author of several works, all of a devotional nature, among them a very curious autobiography, which has been translated into English.

THERMAL, *thur'mal*, **SPRINGS**, or **HOT SPRINGS**, springs the temperature of which is higher than that of the land where they occur. In high altitudes this temperature may be only a few degrees above freezing point; in volcanic regions it reaches the boiling point of water. In some localities thermal springs are subject to eruption (see **GEYSER**), but most of them are quiet boiling pools. The crater of the spring extends to a great depth, and the water is heated by contact with the hot rocks below. Most thermal springs hold siliceous and calcareous matter in solution and deposit it around their sides and along their edges, often making beautiful formations. The waters of some thermal springs are valuable for their medicinal properties, as the Hot Springs, Ark., and Hot Springs, S. D. See **MINERAL WATERS**.

THERMOELECTRICITY. If an iron wire and one of nickel silver are joined and the loose ends attached to a galvanometer,

when the joined ends are heated the galvanometer will show that an electric current is passing over the wires. If the iron and nickel silver are replaced by antimony and bismuth a stronger current will be manifest. *Thermoelectricity* is the name applied to an electric current generated by joining two or more unlike metals and subjecting them to a change of temperature. To insure the best success in practice, the metals should differ in their power to conduct heat. Bismuth and antimony possess this difference in the greatest degree of any metals readily obtainable; therefore they are generally used. The thermoelectric battery, or pile, an apparatus much used in delicate experiments with radiant heat, consists of a series of little bars of antimony and bismuth, or any other two metals of different heat-conducting power, with their ends soldered together and arranged in a compact form, the opposite ends of the pile being connected with a very sensitive galvanometer. To the combined arrangement of pile and galvanometer the name of *thermo-multiplier* is given. The slightest change in temperature generates a current which is manifest in the galvanometer. The instrument is used for detecting minute changes in temperature.

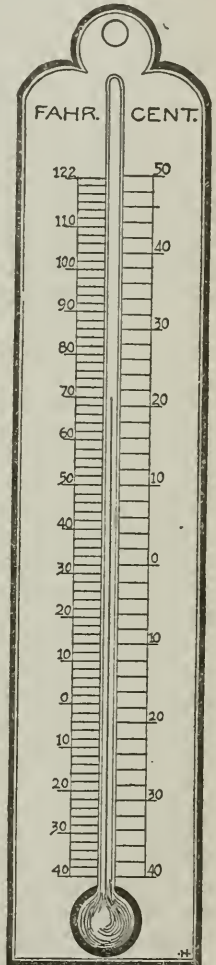
THERMOGRAPH, *ther' mo graf*, a self-recording thermometer. The American instrument, which is the one in most common use, consists of a circular paper disk, graduated on its circumference into hour and minute spaces and divided by concentric circles into spaces indicating degrees of temperature. The disk is moved by clockwork, which causes it to make a revolution once in twenty-four hours. A needle carrying a pen or pencil is so attached to the thermometer that it marks the temperature on the disk, making a complete circuit in a day. See THERMOMETER.

THERMOMETER. If you take hold of an iron rod that has just been removed from the fire, it feels *hot*; on the other hand, if you touch a piece of ice, it feels *cold*. The cause of these sensations is said to be *heat*. The warmer body always gives off heat to a colder. For many years it was believed that heat was a fluid, called "caloric;" about the middle of the nineteenth century the experiments of Joule proved that a definite amount of mechanical work is equivalent to a definite form of heat. In other words, *heat is a form of energy*. Heating or cooling is merely a

transformation of *temperature* or "heat level," as before we might have spoken of a higher water level.

To measure temperature the simplest instrument in use is the thermometer, a long glass tube on one end of which is a bulb partly filled with mercury. The tube is open at the upper end after the mercury is poured in. The bulb is then heated till the mercury rises to the top, when the tube is sealed by means of a blow-pipe. As the bulb cools the mercury recedes, leaving a vacuum at the upper end of the tube. It is clear that there must be some point at which all thermometers agree. Careful investigations have made it certain that under uniform conditions the temperature of *melting ice* and that of *steam* are invariable. These points are generally known as *freezing point* and *boiling point*. On the centigrade scales (centigrade from *centum*, meaning hundred, and *gradus*, meaning steps) the freezing point is marked 0° Centigrade and the boiling point 100° . On the Fahrenheit scale (named after the German scientist Fahrenheit) the freezing point is 32° and the boiling point 212° . Most household thermometers are marked in the Fahrenheit scale, but for scientific purposes the Centigrade scale is much better, because it is readily reduced to decimals.

It frequently happens that we are called on to change temperature readings from the Centigrade scale to the Fahrenheit, or from Fahrenheit to Centigrade. We know that 100° C. equal 212° — 32° or 180° F. (the abbreviations C. and F. are commonly used instead of writing out the



THE THERMOMETER
Showing both Fahrenheit and Centigrade scales.

words). We are asked to find the equivalent in Fahrenheit degrees of a reading of 60° C. We know that

$$100^{\circ} \text{ C.} = 180^{\circ} \text{ F.}$$

$$\text{Then } 1^{\circ} \text{ C.} = 1^{\circ} .8 \text{ F.}$$

$$\text{Therefore, } 60^{\circ} \text{ C.} = 108^{\circ} \text{ F.}$$

In other words, 60° C. above zero will equal 108° F. above the freezing point, because that is the Centigrade zero. But the Centigrade zero is 32 on the Fahrenheit scale. So we must add 32 degrees to give the true reading above the Fahrenheit zero.

$$\text{Therefore, } 60^{\circ} \text{ C.} = 108^{\circ} \text{ F.} + 32^{\circ} \text{ F.} = 140^{\circ} \text{ F.}$$

To change a reading from the Fahrenheit scale to the Centigrade scale is just as simple; we reverse the process. To change 40° F. to Centigrade degrees, we first subtract 32° F. in order to find how many Fahrenheit degrees above the freezing point remain to be changed to Centigrade units. In this case we find there are 8° F. above the freezing point. We already know that

$$180^{\circ} \text{ F.} = 100^{\circ} \text{ C.}$$

$$\text{Then } 1^{\circ} \text{ F.} = \frac{5}{9} \text{ or } 0.555^{\circ} \text{ C.}$$

$$\text{Therefore, } 8^{\circ} \text{ F.} = 4.44^{\circ} \text{ C.}$$

It is possible that a reading above zero on the Fahrenheit scale will be below zero on the Centigrade. In this case our answer would be in minus degrees Centigrade, in other words, below zero.

For the purpose of measuring the quantity of heat gained or lost by a body when its temperature changes, it was necessary to adopt a unit of heat. The one commonly used in connection with the metric system is the quantity of heat that will raise the temperature of one gramme of water one degree Centigrade. It is called a *calorie*. The number of degrees required to raise the temperature of a body through one degree Centigrade is the thermal capacity (from the Greek word *thermos*, which means heat) of the body. The thermal capacity of a unit mass of a substance is its *specific heat*. Specific heat bears the same relation to a calorie as specific gravity does to *g* or gravity, which we have already studied. For example, the specific heat of mercury is 0.033; this means that the heat which will raise 1 gramme of mercury through 1 Centigrade will raise 1 gramme of water through only 0.033 Centigrade. See HEAT; PHYSICS.

THERMOPYLAE, *thur mop' il lee*, a mountain pass in Greece, famous as the scene of one of the most stirring military events in

history. It lies south of the river Spercheus, between Mount Oeta and the Maliac Gulf, and is a gateway from Thessaly into Locris. In ancient times it was only fifty feet wide, and was the only pass by which an army could enter Southern Greece from the north. When Xerxes, king of Persia, with his vast army invaded Greece in 480 B. C., he found the pass defended by Leonidas, king of Sparta, in command of 300 Spartans and 5,000 allies. For two days he unsuccessfully attempted to force a passage. At the end of the second day's fighting the Greeks were betrayed by Ephialtes, a Thessalian, who showed the invaders a path over the mountains. The Persians crossed and attacked the Spartans in the rear. Although overwhelmed by the vast hordes of the enemy, Leonidas and his followers fought to the last, not a Spartan escaping.

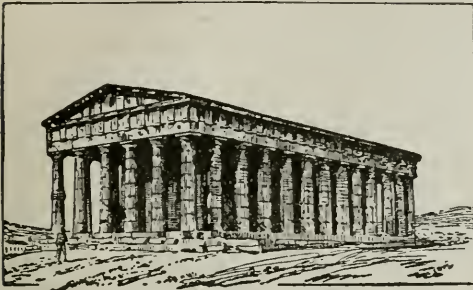
In 279 B. C. Brennus of Gaul attempted to invade Greece by way of the famous pass, but was held in check there; and he, too, succeeded in entering only after a path over the mountains was discovered.

The traveler who to-day visits this scene of ancient heroism finds not a narrow pass, but a swampy plain from one to three miles wide formed by the alluvial deposits of the Spercheus. An interesting feature is a group of hot springs, which gave the pass its name, which means, literally, *hot gates*.

THERMOS BOTTLE, in its commonest form, a double glass container enclosed in a metal case, so constructed as to keep liquids poured into it either hot or cold. The inner glass vessel is fused to the outer after the air between them has been thoroughly exhausted, and the vacuum thus created acts as a nonconductor of heat either from without or within. Within recent years the container has been made of metal; this is a valuable improvement, as glass containers break quite easily. Thermos bottles are of great convenience to travelers who have not access to hot food, and are widely used by automobile tourists and picnickers.

THESEUM, any temple dedicated to Theseus. The most famous of these was the one built at Athens, northwest of the Acropolis, in 473 B. C. The whole was decorated with beautiful paintings, representing events in the legendary life of Theseus. No trace of it remains. The name now commonly refers to a temple at Athens, probably that of Hephæstus, which is the best preserved of Greek

temples. It is of Doric style and is made of Pentelic marble. There are thirteen columns



THESEUM AT ATHENS

on the side, nineteen feet high. The frieze represents myths of Hercules and Theseus. The interior was entirely changed in the early Christian Era to adapt it to church purposes.

THESEUS, *thé'se us*, or *thé'suse*, a legendary king of Athens, son of Aegeus and Aethra. He was reared in seclusion by his mother, and when he became a man he journeyed to Athens, where he was recognized as heir to the throne. Medea, a sorceress, tried to kill him, but failing fled to Media.

When Theseus learned that Athens, as the result of a defeat in war, was compelled to pay to Crete a yearly tribute of seven youths and seven maidens, to be devoured by the Minotaur, he volunteered to go himself with the next victims and, if possible, to kill the monster, which was kept in a vast labyrinth. Theseus promised his grief-stricken father that, if successful, he would on his return change the sails of the ship from black to white. With the aid of Ariadne, daughter of the king of Crete, he escaped from the labyrinth after having killed the Minotaur, and taking the princess with him, set out for home with his joyous companion. He seems to have been a very ungrateful and inconstant lover, for he abandoned Ariadne on an island. Forgetful, too, of his promise to his father, he did not hoist the white sail, and Aegeus, when he saw from far off the black sail approaching, threw himself into the sea, which has been named for him (Aegean).

Theseus became king of Athens, and many were the wonderful deeds which he did. For a time he was greatly beloved by his people, but in his later years he grew tyrannical and was at length banished from his kingdom. See MINOTAUR; ARIADNE.

THESSALONIANS, EPISTLES TO THE, two New Testament epistles, written by Saint

Paul to the church at Thessalonica, in all probability during his long stay at Corinth, therefore not very long after the foundation of the Thessalonian church on Saint Paul's second missionary journey.

THES'SALY, the northeastern division of Greece, consisting, mainly, of a rich plain, enclosed between mountains. Mounts Pelion and Ossa, on the east, and on the northeast, Mount Olympus, fabled abode of the gods, are the most celebrated peaks.

In the earliest times Thessaly proper is said to have been inhabited by Aeolic and other tribes. Subsequently it was broken up into separate confederacies, and it seldom exerted any important influence on the affairs of Greece. Thessaly was conquered by Philip of Macedon in the fourth century B. C., became dependent on Macedonia, and was finally incorporated with the Roman Empire. After the fall of the Byzantine Empire it came into the hands of the Turks, who held it until 1881, when it was formally ceded to Greece by the terms of the Congress of Berlin. The majority of the inhabitants are Greeks.

The present political divisions of Thessaly are the departments of Phthiotis, Larissa, Karditsa, Trikkala and Magnesia. The total population is 575,000. Volo is the most important port.

THETFORD MINES, QUE., in Megantic County, on the Quebec Central Railroad, seventy-six miles from Quebec. The name indicates sufficiently the character of the industries; the city is in the richest asbestos district in the world. There are sash and door factories, sawmills, foundries and manufactures of cement blocks. Population, 1916, 7,550.

THE'TIS, in Greek mythology a sea nymph, daughter of Nereus and Doris. By Pelus she became the mother of Achilles.

THIERS, *te air'*, LOUIS ADOLPH (1797-1877), a French historian and statesman and former President of the republic. He was born at Marseilles and was educated for the law, which he forsook for literature and politics. In 1818 he went to Paris and began to write for the *Constitutionnel* and other journals. In 1830 he helped to found the *National*, an organ in opposition to the established government, which did much to bring about the revolution of the same year.

During the reign of Louis Philippe he held various offices, and after the Revolution of

1848 he was elected deputy to the Assembly. He voted for the presidency of Louis Napoleon, but became, later, one of his fiercest opponents, and in 1851 he was arrested and banished. Returning to France in the following year, he went into retirement, but in 1863 he was elected to the Chamber of Deputies. During the crisis of the Franco-German War and the overthrow of the Empire, Thiers came to the front as the strongest man in France. After the fall of Paris he was declared chief of the executive power, and in August, 1871, the Assembly prolonged his tenure of office and changed his title to that of President. His decided views very naturally called forth opposition, and so strong did this become that in 1873 he resigned. From 1876 until the time of his death he was a member of the Chamber of Deputies. Thiers's chief works are *A History of the French Revolution* and *A History of the Consulate and the Empire*.

THIRST, *thurst*, the sensation experienced from a lack of water in the tissues of the body. The sensation is chiefly referred to the throat and mouth, but the condition is really one affecting the entire body. Thirst is a common symptom of fever and of those diseases in which there is a loss of water from the body, as in cholera and diabetes, or when there is a loss of blood. It is also produced by highly seasoned food and by exercise that causes free perspiration. The feeling of thirst may be quenched not only by drinking, but by absorption through the skin by injecting fluids into the veins. Water forms nearly three-fourths the weight of the body and it is essential to the maintenance of life. To maintain the best physical condition one should drink from six to eight glasses of water daily.

THIRTY TYRANTS, the committee of rulers appointed from the aristocratic class at Athens, at the close of the Peloponnesian War. This war was a conflict between democracy, as represented by Athens, and an oligarchical government, as represented by Sparta; and the success of Sparta gave her the power to force upon Athens an oligarchical government. The rule of the Thirty Tyrants was most oppressive, but it lasted for only a year, the old democracy being restored in 403 B. C.

THIRTY YEARS' WAR, a desolating war in Germany, which lasted from 1618 to 1648. It started as a struggle between the Protestant

and the Catholic party, but gradually involved almost all the states of the continent, degenerating at last into a struggle for political power and territory.

The religious question had been by no means settled by the Peace of Augsburg of 1555, and a clash was inevitable. Foreseeing this, the Protestants formed a league for their mutual protection, called the Evangelical Union, and in the following year the Catholics, to offset this, formed the confederation known as the Holy League.

First Phase. The war broke out in Bohemia. A dispute arose between the Protestants and Catholics as to the right of the Protestants to build a certain church, and as the king decided against the Protestants, a body of Protestants, led by Count Thurn, entered the royal palace at Prague on the night of May 23, 1618, and hurled two representatives of the Crown from the windows. They gained control of the government and, declaring Ferdinand II's title to the crown void, made Frederick, the Palatine elector, king of Bohemia. Because Frederick was a Calvinist, many of the Lutherans withheld their support; and when, soon afterwards, Ferdinand II became Holy Roman emperor with greatly increased power, he retaliated by bringing an overwhelming force against the Protestants, and the rebellion was crushed in that quarter. But Ferdinand's harsh treatment of the conquered people and his attitude toward all Protestants stirred the Protestant princes in other parts of Europe, and the trouble spread to Holland and other northern countries and even to England.

Danish Period. In 1625 Christian IV, king of Denmark, supported by England and Holland, came out openly as a champion of German Protestantism. On the side of the Catholics there were at this time two noted commanders, Tilly, the leader of the forces of the Holy League, and Wallenstein, the commander of the Imperial Army. This period of the war proved disastrous to the Protestant allies, and Christian IV in 1629 concluded, with the emperor, the Peace of Lübeck and retired from the struggle. Before this, however, Ferdinand had issued the Edict of Restitution, in accordance with which all property acquired by the Protestant Church since the Peace of Augsburg was returned to the Catholics. This decree was of course obnoxious to the Protestants, and it was clear that it could be enforced only by war.

Swedish Period. The third period of the war, known as the Swedish period, began in 1630, when Gustavus Adolphus, king of Sweden, entered the struggle. He was impelled to take up arms not only because of his devotion to Protestantism, but because Ferdinand's ambitious schemes endangered Sweden. In 1630, with 16,000 men, he started to the relief of Magdeburg, then under siege by Tilly, but it fell before he could reach it, and all the inhabitants were massacred.

To meet the Swedish army which was advancing toward him, Ferdinand recalled Wallenstein, whom, owing to unpopularity in many quarters, the emperor had dismissed. Joined by numerous volunteers and aided by French money, Gustavus Adolphus advanced and routed Tilly in several engagements and finally won a complete victory in the Battle of Lützen, in which he was killed.

The war was then carried on by the Swedish forces under the chancellor Oxenstierna, till the rout of the Swedish forces at Nördlingen (September, 1634) again gave to the emperor the preponderating power in Germany. The elector of Saxony, who had been an ally of Gustavus, now made peace at Prague, and within a few months the treaty was accepted by many of the German princes. The Swedes, however, thought it to their interest to continue the war, while France, which desired to see its old enemy, Austria, crushed, resolved to take a more active part in the conflict. Thus the last stage of the war was a political contest of France and Sweden against Austria.

French-Swedish Period. The struggle continued, and the united armies of the French, under the great generals Turenne and Condé, and of the Swedes, under Torstensson and Wrangel, won a series of victories. But all Europe was sick of war, and in 1645 representatives of the European powers met in two cities in Westphalia and in 1648 the Peace of Westphalia was concluded. The Thirty Years' War left Germany in a state of complete exhaustion. Whole provinces were devastated, and the population was decreased by half.

Related Articles: Consult the following titles for additional information:

Ferdinand II	Reformation
Germany (history)	Richelieu, Cardinal
Gustavus II Adolphus	Tilly, Johann
Lützen, Battles of	Wallenstein
Magdeburg	Westphalia, Peace of

THISTLE, *this'l*, the common name of a widely-distributed group of prickly plants of

the composite family. There are numerous species, most of which are natives of Europe. The leaves are usually coarse and armed with spines, or prickles. Thistles spread by means of seeds and creeping roots. The common *cotton thistle* attains a height of from four to six feet, and is so called because of its covering of white down. It is often regarded as the Scotch thistle, but it is doubtful whether the thistle which constitutes the Scottish national badge has any existing type, though the stemless thistle is in many districts of Scotland looked upon as the true Scotch thistle.

About a dozen species of thistle are common in the United States, spreading from New England to Florida. The *Canada thistle* (which see) is one of the gravest pests of the farmer.

THISTLE, ORDER OF THE, a Scottish order of knighthood, sometimes called the Order of Saint Andrew. It was instituted by James V in 1540 and reorganized by James II of England in 1687. It fell into abeyance during the reign of William and Mary, but was revived by Queen Anne in 1703. The star of the order is of silver, with eight rays, and with a thistle in the center, surrounded by the Latin motto, *Nemo me impune lacessit* (No one injures me with impunity). The ribbon is green. The statute of 1827 limited the number of knights to sixteen members of the Scottish nobility, in addition to the sovereign and princes.

THISTLEBIRD. See AMERICAN GOLDFINCH.

THOMAS, *tom'as*, AUGUSTUS (1859-), a leading American playwright, born in Saint Louis, Mo. Before gaining recognition as a dramatist, he served as special writer on numerous papers and later was editor and proprietor of the Kansas City *Mirror*. Since the production of his initial success, *Alabama*, in 1891, he has devoted himself entirely to dramatic work. *In Mizzoura*, *Arizona*, *The Man Upstairs*, *Mrs. Leffingwell's Boots*, *The Witching Hour*, *As a Man Thinks* and *The Copperhead* are among his most popular plays. Since the death of Charles Frohman, 1915, he has been art director of the Frohman theatrical enterprises.

THOMAS, GEORGE HENRY (1816-1870), a distinguished American soldier who won the title "The Rock of Chickamauga" because his unflinching courage saved the Union army from total defeat at Chickamauga. He was born in Southampton County, Va., and was educated at West Point. He engaged in the

Mexican War, was appointed professor at West Point in 1850, but was recalled to active service in 1855, serving as major in Texas against the Indians. When the Civil War broke out, Thomas was appointed brigadier-general of volunteers in the Federal army. He took part in the Battle of Murfreesboro, and at the bloody Battle of Chickamauga, in September, 1863, saved the Federal army from destruction. He also commanded the Army of the Cumberland at Missionary Ridge, and in 1864 cooperated with Sherman in his march on Atlanta. Returning from Atlanta to Tennessee, he defeated Hood and compelled the Confederates to raise the siege of Nashville, for which he was breveted major-general in the regular army.

THOMAS, THEODORE (1835-1905), a distinguished American orchestra conductor, born at Hanover, Germany. He removed to the United States in 1845 and played in New York for two years, later accompanying Jenny Lind upon her first American tour. He founded an orchestra in 1861, which became famous throughout the world. In 1878 he went to Cincinnati, as director of the College of Music at that city, and for ten years conducted the Brooklyn Philharmonic Society. In 1891 he established in Chicago one of the world's greatest orchestras, supported by popular subscription. In 1904 a magnificent recital hall was built for the orchestra at a cost of \$750,000, but Thomas died soon after, from overwork in connection with its dedication. He presented only the best in music and lived to see his audiences enthusiastically won over to his own high ideals. Frederick Stock (born 1872) succeeded him as director of the Thomas Orchestra, which was later renamed the Chicago Symphony Orchestra.

THOMAS à KEMPIS (1380-1471), that is, Thomas of Kempe, was born at Kempen, in the archbishopric of Cologne, about 1380. His family name was Hamerken. At the age of twenty he retired to an Augustine convent, near Zwolle, in Holland, where he took the vows. He was a voluminous writer. His works (the printed ones all in Latin) consist of sermons, exhortations, ascetic treatises, hymns and prayers. His name, however, would hardly be remembered, were it not for its connection with the celebrated devotional work called *The Imitation of Christ* (*De Imitatione Christi*), a work which has passed

through thousands of editions in the original Latin and in translations. The authorship of this book is generally ascribed to à Kempis.

THOMPSON, tom'p'son, DAVID (1770-1857), a Canadian explorer, born at Westminster, England, and educated at Oxford. In 1789 he emigrated to America, where he engaged in exploration of the Great Lakes and Hudson Bay region, in the service of the Hudson's Bay Company. He crossed the Rocky Mountains in 1807 and followed the course of the Columbia River to its mouth in the Pacific. From 1816 to 1826 he assisted in the survey of the Canadian and United States boundary, and he subsequently explored the Northwest Territory of Canada.

THOMPSON, DENMAN (1833-1911), an American actor, known chiefly for his presentation of Joshua Whitcomb, the central figure in *The Old Homestead*. He was born at Beechwood, Pa., but went with his parents to New Hampshire when a child, and there gained the intimate acquaintance with New England character which made his "Josh Whitcomb" famous. He first sketched this character in 1875 and the following year wrote a play around it—a play which with minor changes he produced almost until the time of his death.

THOMPSON, JAMES MAURICE (1844-1901), an American writer best known for his admirable romantic novel of the Revolutionary period, *Alice of Old Vincennes*. He was born in Fairfield, Ind., and spent much of his boyhood in Georgia, and Kentucky. He fought in the Confederate army and after the war settled in Crawfordsville, Ind., engaging in law practice and civil engineering. Meanwhile, he had begun to write, and subsequently he became editor of *The Independent* (New York). His writings include poems, literary reviews, nature books and a treatise on archery, on which he was an enthusiast. Some of the titles of his books are *Hoosier Mosaics*, *Songs of Fair Weather*, *The Boy's Book of Sport* and *The Ethics of Literary Art*.

THOMSON, tom'son, JAMES (1700-1748), a Scottish poet, born at Ebnam, in Scotland, and educated at the University of Edinburgh. He went in 1725 to London, and there wrote his first important group of poems, *The Seasons*. This work was of importance in the history of English literature because it was the first attempt to abandon the old formula and artificial treatment of nature and to express a feeling for its beauties. The

poem marked the beginning of the Romantic movement.

In 1740 Thomson composed, in conjunction with Mallet, *The Masque of Alfred*, which contains the famous song, *Rule Britannia*. In 1748 his *Castle of Indolence* appeared, a work which reproduces not only the meter, but to a certain extent the spirit, of Spenser's *Fairie Queene*, and this is, in many respects, Thomson's best work. Thomson was greatly beloved for his amiability and kindness of heart.

THOMSON, WILLIAM. See **KELVIN, LORD.**

THOR, in Scandinavian mythology, son of Odin, and the god of thunder. He was the most powerful among the gods. As the special patron god of peasants, Thor entertained them after their death, as Odin, his father, entertained their masters in Valhalla. Thor possessed a magic red-hot hammer, made for him by the dwarf Loki. He would sometimes ride across the sky in his brazen chariot and then the lightning would flash from his hammer; and when he would throw it the thunder would roll. Thursday was named in honor of Thor.

THORACIC, *thor as'ik*, **DUCT**, the principal tube of the system of lacteals and lymphatics, extending upward along the spinal column to the seventh cervical vertebra, where it pours the contents which it has gathered from the intestines, the trunk, the left arm, the lower extremities and the left side of the head, into the left subclavian vein. This tube is from fifteen to eighteen inches long and one-eighth of an inch in diameter, is made up of three coats and is well supplied with valves.

THORAX. See **ABDOMEN; SKELETON.**

THOREAU, *tho'ro* or *thoro'*, **HENRY DAVID** (1817-1862), an American naturalist and writer, born at Boston and educated at Harvard University. For

about five years after his graduation he taught school, and then for several years he occupied himself in various ways, in land surveying, carpentering and other handicrafts. He spent no

more time on work than was absolutely necessary to provide food and clothing for himself, and he devoted the greater part of his time to study and the contemplation of nature. In 1845 he built for himself a hut in a wood near Walden Pond, Concord, Mass., and there he lived for two years, gaining a remarkable knowledge of the woodland life about him. Besides contributing to the *Dial* and other periodicals, he published *A Week on the Concord and Merrimac Rivers* and *Walden, or Life in the Woods* (1854). After his death appeared *Excursions in Field and Forest*, *The Maine Woods*, *Cape Cod* and *Early Spring in Massachusetts*.

THORIUM, a metallic element discovered in 1828 by Berzelius, a Swedish chemist. It is a heavy gray powder, which burns with a bright flame when heated in air. It is widely distributed, occurring in orangite, thorite, monazite and such minerals. The dioxide, called thoria, is used in making gas mantles for Welsbach burners.

THORN APPLE. See **STRAMONIUM.**

THOROUGHWORT, *thur'o wurt*. See **BONESET.**

THORWALDSEN, *tore'vald zen*, **BERTEL** (1770-1844), the greatest sculptor Denmark has produced, and one of the foremost modern representatives of classicism in sculpture. He began his art studies at the age of eleven, at Copenhagen, his birthplace. Before he was thirty he won a scholarship that enabled him to study in Rome, where he was much influenced by Canova. His first important work, *Jason with the Golden Fleece*, made in 1803, brought him an important commission, and from this time his reputation grew. To this early period belong *Entry of Alexander the Great into Babylon* and the model for the *Lion of Lucerne*.

When the sculptor returned to Copenhagen he was honored with an ovation. While there he was commissioned to design several pieces of sculpture for the Church of Our Lady, and among these is the well-known figure of *Christ*, one of his masterpieces. On his return to Rome he received many important commissions, and in 1825 was elected president of the Accademia di San Luca. He died in Copenhagen, and was buried with princely honors. A Thorwaldsen museum there contains a large collection of his work. Among his more important pieces are *Memorial to Baroness Schubart*, *Cupid and Psyche*, *Morning, Night* and *The Four Seasons*. The artist



**HENRY DAVID
THOREAU**

was particularly successful with ideal and mythological subjects, but was not so strong in characterization or in dramatic action.

THOTHMES, *thoth'meez*, III, a king of Egypt, one of the most famous of Egyptian rulers. He came to the throne about 1538 B. C., but during the early years of his reign his half sister Hatasu ruled, much against his wish. On her death Thothmes gained control of the government, and he gratified his spite by erasing her name from every monument and temple she had built.

He soon began a series of conquests without equal in Egyptian history. Palestine, Syria, a part of Mesopotamia and the region between the Euphrates and the Mediterranean were subdued by him, and an account of his deeds was inscribed on the walls of the Temple of Karnak, which he enlarged. One of the great obelisks which he erected is now in Central Park, New York; another stands on the Thames Embankment, in London.

THOUGHT, *thaut*, the mental power by which we compare ideas and classify them according to their resemblances and differences. The power of thought is the distinguishing feature between the human mind and the minds of lower animals. The first step in thinking is the formation of concepts; the second is the formation of judgments, and the third is reasoning. There is but one thought process, and the difference in these steps is one of degree only. In the formation of concepts we compare qualities in sense perceptions and classify these perceptions according to their agreement or disagreement. In the formation of judgments we compare and classify concepts, in reasoning we compare judgments, and from this comparison we form a third judgment.

The Laws of Thought. The fundamental laws of thought are the law of identity, the law of contradiction and the law of the excluded middle. The *law of identity* means that the same thing or quality is always the same thing or quality, whatever the conditions or circumstances under which it exists. However simple this law may seem, inability to apply it leads to many failures. It is because the boy cannot see that the principles of multiplication and division are the same, wherever they occur, that he has so much difficulty with his operations in common fractions and decimals, and it is because the lawyer cannot discover the un-

derlying principles of law that he loses his case. This law of identity deals with fundamental principles and rules, and in order that it may be applied in all the varying conditions of life, the principles and laws pertaining to the various branches in a course of study should be thoroughly understood.

The *law of contradiction* means that a thing cannot exist in opposite conditions at the same time. A man cannot be dead and alive at the same time. The *law of excluded middle* means that a thing must be or must not be. A coat is either black or not black; an apple is sour or not sour. Gradations in quality form many apparent exceptions to this law, but they should not be so regarded. In forming judgments one should keep the quality under consideration constantly in mind and then determine whether the object compared does or does not agree with this quality. Failure to observe this simple law often leads to indistinct ideas and loose qualifications.

Children's Thinking. While the child begins to think as soon as he begins to form concepts, the thought power develops slowly during the first few years, and he relies almost entirely upon his powers of observation and memory. To tax a child's reasoning power before he is twelve years of age is unwise, because this can be done only at the expense of the training of the powers of observation and memory, which up to this time are particularly active, and also because the overtaxing of a mental power in its immature state cripples its development in after years. Children whose reasoning powers are overtaxed at an early age seldom make good thinkers or correct reasoners. However, the thought power should not be neglected, but within his capacity the child should be encouraged to compare, judge and classify his ideas.

Related Articles. Consult the following titles for additional information:

Apperception	Logic
Attention	Memory
Association of Ideas	Psychology
Child Study	Reason
Concept	Syllogism
Judgment	Will

THOUSAND AND ONE NIGHTS. See ARABIAN NIGHTS.

THOUSAND ISLANDS, a group of about 1,750 islands in the Saint Lawrence River, just below its emergence from Lake Ontario; many are mere points of rock,

while others have an area of several acres and are covered with vegetation. The section of the river containing the islands is known as Thousand Island Park. The precipitous rocks and shady groves add much to the beauty of its scenery, and the climate during summer is delightful. Beautiful summer homes, many in the form of medieval castles, have been built upon privately-owned islands. Alexandria Bay, the most important town in the park, has all the attractions that make an ideal summer resort.

THRACE, a name applied at an early period among the Greeks to a region lying north of Macedonia. Besides possessing rich meadows and corn lands, the country abounded in mines, while the Thracian horses and riders rivaled those of Thessaly. Of the rivers of Thrace, the largest and most celebrated was the Hebrus (now Maritza). Abdera, the birthplace of Democritus and Protagoras; Sestos, on the Hellespont, celebrated in the story of Hero and Leander, and Byzantium, on the peninsula on which Constantinople now stands, were the places of interest.

THRASHER. See BROWN THRASHER.

THRASHING MACHINE, a machine used for separating grain from the straw and chaff. It is, next to the harvester, the most important agricultural machine. Without it, it would be impossible to prepare the immense crops of wheat, oats, barley and rice for use; indeed, it made great crops possible.

The essential parts of a thrashing machine are the beater, or drum, containing iron teeth projecting from its surface; the *concave*, which is a cast-iron plate, having the shape of a section of the inside of the beater, and fitted with similar teeth, so arranged that the teeth of the revolving beater mesh into them; the *straw carrier* and the *shaker*; the *blowing drums*, sometimes called *rakes*, which assist in separating the loosened grain from the straw, the *winnowing apparatus*, which consists of a blower and a set of screens, that have a vibratory motion and are so graduated that they separate small seeds from the grain, and the *stacker* which carries away the straw. The machine is operated by horse power or steam power. Machines for thrashing on small farms of the Eastern and Central states are usually operated by horse power, while those used on the large wheat farms of the West and Northwest are oper-

ated by steam power, usually with an engine of 12 or 15 horse-power capacity. One of these machines will thrash from 1,200 to 1,500 bushels of wheat in a day.

History. The earliest method of thrashing was by beating out the grain with a stick. Later the grain was trodden out by animals or men. Still later a so-called *sledge* was rolled over the sheaves. This was followed by the flail, consisting of two sticks fastened together at one end by thongs. Using one as a handle, the thrasher brought down the other horizontally upon the grain. The first successful thrashing machine was invented by Michael Sterling, a Scotch farmer, in 1758, but since that time Sterling's pattern has undergone many changes and improvements.

THREAD, *thred*, a slender cord, made of two or more strands, twisted together. Thread is made of cotton, linen and silk, but the manufacture of cotton thread so far exceeds that of the others in quantity and value that this is the sort of thread meant when the term is used without qualification. Cotton thread is made from the long fiber, or Sea Island, cotton (see COTTON). The process is long and somewhat complicated. The fiber is carefully picked and carded. As the cotton passes from the carding machine, it is packed into a thick, soft card, which is coiled into a can. These coils of ropes pass to the *drawing frame*, which is an arrangement for passing the ropes between a series of rollers, each succeeding set moving faster than the one before, so that the cotton is drawn out fine and thin, like a ribbon. From the drawing frame the cotton passes to the *doubling frame*, which compresses it into a very fine, delicate strip. These strips are then lapped and again drawn out; then recarded, for the purpose of removing any imperfections that may remain. From the second set of cards the threadlike roll or cord is wound upon a bobbin. Six of these are then twisted together, into a large-sized yarn, which is reduced by successive spinings until it reaches the size of a coarse cotton yarn. From this the thread is spun. Several spinings are necessary to complete the operation, since thread of the best quality must contain a number of strands, each of which is hard twisted, and all of which are thoroughly twisted together. After spinning, the thread is inspected, then bleached, if white thread is desired, or colored, and wound upon spools for the market.

THREAD WORM, a threadlike intestinal worm annoying to all higher animals, including human beings. Children are the most frequent sufferers.

THREE RIVERS, QUE., on the north bank of the Saint Lawrence River, at its confluence with the Saint Maurice, and on the Canadian Pacific and the Grand Trunk railways, nearly one hundred miles northeast of Montreal. It is one of the oldest towns in Canada. The chief industry is manufacturing, the principal products being lumber, machinery, iron pipe, tools, boots and shoes, paper and foundry supplies. Population, 1911, 13,691.

THRIFT. "Society," wrote Samuel Smiles, "mainly consists of two classes—the savers and the wasters, the provident and improvident, the thrifty and thriftless, the haves and have-nots." In Christ's parable of the talents there is a graphic picture of the "haves" and the "have-nots." The former were the industrious servants who doubled the talents given them by their master. The "have-not" in the story hid his talent in the ground and was empty-handed when his master returned and asked for a reckoning. Our parable concludes with the often-quoted saying, "For unto every one that hath shall be given, and he shall have abundance; but from him that hath not shall be taken away even that which he hath." These words sum up well the thrift idea.

The Length and Breadth of Thrift. The average person thinks of thrift chiefly in terms of money saving. While that is important, it is only one phase of thrift. The really thrifty person is one who saves not only money, but time and strength and effort. Thrift, moreover, means mental and moral discipline. It means exercising will power, sacrificing personal desires, overcoming temptation. Some of the various phases of thrift are discussed in the following paragraphs.

Saving and Spending. "Make all you can, save all you can, give all you can" is advice attributed to John Wesley. This is good advice because one who follows it must of necessity be industrious, saving and generous. A thrifty person is a happy medium between a spendthrift and a miser, either one of whom is an undesirable citizen. There is no one who is not benefited by acquiring the saving habit. The family of small income, the working girl, the boy starting at the bot-

tom of the ladder of industry, the business man and the capitalists alike need a surplus, whether it be money laid aside for the proverbial rainy day, money for investment or working capital.

Two brothers earning moderate salaries began married life at the same time. A married girl who had earned her own living for several years, and who knew the value of money. The young couple decided that they would devote the portion of A's salary allotted for rent to buying a home. They found a modest house in the suburbs, made an initial payment, and arranged to pay for the home at the rate of thirty-five dollars a month. They figured that this monthly installment (which included principal and interest) plus insurance, taxes and repairs, would make their total rent about fifty dollars a month. B preferred to rent a heated flat. "When you count up your expenses and the worry and work a house brings you you aren't ahead at all," he said to his brother. But Mr. and Mrs. A were satisfied with their plan. Ten years passed by. Each brother had spent about \$600 a year for shelter, and A had endured his share of work and worry, as his brother had prophesied. B had had shelter, plus janitor service, plus heat, and was saved insurance bills and taxes. Yet at the end of ten years one brother had his home paid for, and its value had increased one-third, which offset the money he had spent in repairs and improvements. B had—exactly nothing. He had spent \$6,000 for rent, and at the end of the period he was just where he started.

Saving is most successful when it is done methodically and regularly. A working girl who was considered a good manager by her friends told one who inquired that she systematically divided her monthly salary each pay day. So much was allotted for regular expenses (which do not greatly vary from month to month), so much for pleasure, and so much for her savings account. The amount saved each month always had to reach a certain figure. When she had to buy clothes this figure was lower than at other times, but it never went below a certain minimum. This girl kept a record of all her expenditures, so that she knew exactly where her money went. After several years of business life she had saved enough to take a coveted trip to Europe, and she had still a respectable surplus in the bank.

The school savings bank movement is teaching children to save regularly and helping them to form thrifty habits. It is the testimony of the majority of young people starting out in business life that the average employer prefers to advance those who have the savings-bank habit. A business man argues that a young man who will save for himself will save for the firm, and thrifty personal habits make a good foundation for effective service.

Thrift of Time. "Dost thou love life?" asks Benjamin Franklin in his *Almanac*. "Then do not squander time, for that is the stuff that life is made of." Another noted man has observed, "If I know what a boy does in his spare time, I can tell you what kind of man he will be." Arnold Bennett, in his interesting essay on "How to Live on Twenty-four Hours a Day," replies to the familiar plea of "I haven't the time," with the pertinent retort "You have all the time there is." Furthermore, every individual has exactly the same allotment of this precious fabric of life. The wise are those who know how to use it to good advantage.

Consider what can be accomplished by the wise use of spare moments. In one year 46,225 school boys in the Southern states planted and cultivated an acre of corn each, and the work was all done in their spare time. In another year something like 24,000 boys and girls in various parts of the Union produced through spare-time labor over \$509,000 worth of food products. There are thousands of young people to-day who are earning good salaries because they previously devoted their spare time to learning something that would help them to advance. There are many others who have made no progress because they have dawdled away their spare moments.

Boys and girls should learn to make good use of every hour of the day. When they study they should concentrate, and when they play they should play with zest. Theodore Roosevelt said, "When you play, play hard, but when you work do not play at all." A disagreeable task seems twice as distasteful when one lingers over it, and putting off necessary but unpleasant duties is as useless as it is wasteful. Start the day right by getting up at the first call, and keep the day right by wasting none of its precious minutes.

A Stitch in Time. A French writer tells a story of a country family who neglected to mend the gate to the stock and poultry yard.

One day a fine pig escaped through the broken gate, and the family, including the gardener, cook and milkmaid, started in pursuit of the fugitive. The gardener was the first to overtake him, and in leaping out of a ditch to cut off the pig's escape, sprained his ankle. When the cook returned to the house she found that the linen which had been hanging before the fire was so badly scorched that it was ruined. The milkmaid, on her return to the cowshed, found that in the excitement she had forgotten to tie up the cattle, and one of the cows had escaped and had broken the leg of a colt that happened to be kept in the same shed. The sprained ankle of the gardener kept him in bed for two weeks, and the loss of his work, plus the cost of the linen, plus the damage to the colt, made a rather large total of expense. All of this resulted from the want of a latch which would have cost a few cents.

Carelessness, neglect and forgetfulness are arch foes of thrift and stumbling blocks in the path of progress. Two girls, whom we will call Amy Barker and Fanny Leslie, were graduated in the same high school class. Both were poor girls, and both had to go to work on leaving school. Their principal found them positions in a department store and a year later he visited the store manager to see how his former pupils were prospering. He found that Amy Barker was head assistant in the department of children's dresses, but that Fanny Leslie was merely a salesgirl at an unimportant notion counter. When questioned, the store manager made the following explanation:

"Miss Leslie is fully as bright as Miss Barker, and she makes a more striking appearance, but we have not been able to advance her because she is too careless about details. Miss Barker from the beginning has been very conscientious about small things. She learned all she could about the stock and remembered what she learned, so that she could always answer our customers' questions and make intelligent suggestions. Her sales slips were always made out neatly and correctly, and we never had to trace goods sent astray because of her illegible writing. We never had to fill orders over again that she attended to. Accordingly, she has been advanced steadily and is now first assistant to the manager of an important department. In a few years from now you will see her one of our buyers at a very good salary. I am sorry that Miss Leslie has not done so well. She cannot

be trusted to remember prices, or what we have in stock. She made so many mistakes in writing names and addresses that we had to put her in the notion department, where deliveries are the exception. We cannot trust her to measure goods correctly, and unless she takes herself in hand and improves she may not even keep the position she has. It is a great pity, for she has a very pleasing personality and could make an excellent sales person if she would put her mind on details."

This girl's case is typical of so many in the business world that it is too bad some one doesn't start a thrift school for the negligent. This form of thriftlessness is not, however, confined to business girls. Negligence is a widespread failing. Thousands of lives are lost every year and millions of dollars' worth of property destroyed in fires, wrecks and accidents, because somebody has been careless, or forgetful, or has made a mistake. Over 3,000,000 pieces of mail have to be destroyed in a single year by the United States Post-office Department because they have been mis-directed. Street-car companies, stores and other public institutions have to maintain special departments to take care of the things that people lose.

If every careless person would set down in a notebook at the end of each day the amount of time, money and patience that had been wasted that day, because of avoidable negligence or forgetfulness, he would have an illuminating record at the end of a week. A certain teacher, distressed by the careless habits of many of her pupils, asked them to each make out a "careless list" during one week. A week later the papers were handed in and the confessions were compiled by the teacher. This is what she reported to her shamed-faced pupils:

"I find," she said, "that fifteen slate pencils, nine lead pencils, two knives, five handkerchiefs, two hair ribbons, one book and a pair of rubbers have been lost this week. This alone represents an expenditure of three or four dollars. Ten of you report that you forgot errands, messages and commissions of one sort or another and thereby put your mothers to much inconvenience. Because one boy forgot to leave an order at the grocery for sugar his mother had to buy two cakes at the bakery, for she had promised them for the church supper. A girl reports that she forgot to tell her father that Dr. Smith wished to see him and that her father lost a day's

work by her carelessness. Several of you say that you forgot to take necessary books home from school and had zero marks in recitations the next day. One boy forfeited his week's allowance because he had too many zeros. Several of the cases of tardiness are the result of starting out from home without something and having to go back. Now, my pupils, do you think that a class with such a record will do anything worth while in life, or attain success in anything? How many of you will join a 'Think first club' and clean up this dreadful record?" Every hand in the room was raised, and from that time on the pupils began to improve. That teacher helped her pupils to remember their new resolutions by writing on the blackboard an old-fashioned proverb she had learned as a school girl.

For the want of a nail the shoe was lost;
 For the want of a shoe the horse was lost;
 For the want of a horse the rider was lost;
 For the want of a rider the battle was lost;
 Because of the battle the kingdom was lost;
 And all for the want of a horseshoe nail.

Health Thrift. Taking care of the health is on a par with storing up material wealth. Progressive industrial institutions now make it their business to see that their employes work under healthful conditions, for it is obvious that a larger and better output is produced by workers who feel well than by those who are physically unfit. Many city department stores endeavor to reduce absence from work to a minimum by providing gymnasium and recreation rooms for their employes. Ill health is an expense wherever it is found, and no one can afford to ignore the needs of the body.

Very often what people like to do is the opposite of what they ought to do, and the sacrifice of preference is frequently necessary for the preservation of health. A teacher who noticed that one of her bright pupils was becoming lazy, irritable and stupid, made an investigation. She discovered that his too indulgent parents gave him a generous amount of spending money, and that he had formed the habit of going to a picture show every night in the week with an older brother. They always bought candy or peanuts, and never came home before ten o'clock. One day, after school was dismissed, this teacher and the boy had a serious conversation.

"John," she said, "What would you think of a man who had worked hard to accumulate

money to buy him a house, and who put that money in a bag with a hole in it, tied the bag over the edge of a boat, and went rowing down the river?" "Why," said the boy, "anyone who would do that would be insane." "Exactly," replied his teacher. "Now tell me what you think of a boy who is throwing away his health in the same way. John, why do you come to school every day tired and sleepy?" "Why," stammered the boy, "I guess I don't go to bed early enough." "And why," continued his teacher, "did you have such a headache yesterday that you had to be dismissed early?"

The boy hung his head. "I ate too many peanuts the night before, and they weren't roasted well. Mother said I had indigestion." "I think you see what I am getting at," said the teacher. "You can't sit in a stuffy theater every night, lose needed sleep and eat indigestible food without sacrificing one of the most precious possessions you have. Wouldn't you like to regain the good spirits and enthusiasm you used to have when you were at the head of the class and never knew what a headache meant?" John considered this a minute before he answered: "I don't honestly feel as well as I used to, but I like to go to the shows and I like candy." "The trouble with you, John," said his teacher, "is that you are being a spendthrift. You are spending all your health for something not worth while. Once a week is often enough for any boy of your age to go to a picture show, and you ought to select that one with great care. You used to find pleasure in baseball and swimming, and I am sure a healthy appetite for good home cooking is more enjoyable than the pleasure you get from eating cheap candy and underdone peanuts. Promise me to buy no candy for a week, to go to bed early every night, and to stay away from the theater until the end of the week. I want you to make this a test."

John was a boy who could listen to reason, and he followed his teacher's advice conscientiously. A week later he made this report to her: "I know now I was foolish to waste all that time and money, and I am going to keep on as you told me to last week. I feel ever so much better and can get my lessons much quicker." This boy had learned the difference between being a health spendthrift and a health saver.

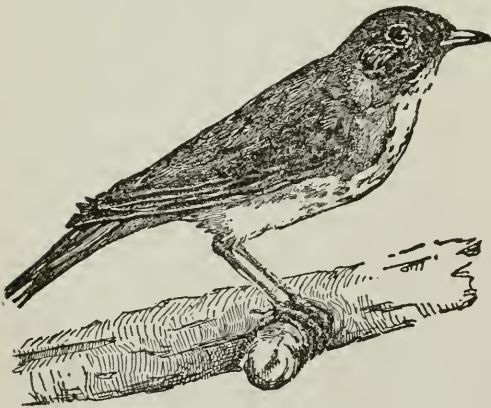
America's Thrift Campaign. The American people have frequently been criticized for

their lack of thrift. In 1913 Mr. Simon W. Straus organized the American Society for Thrift, for the purpose of educating the people along the line of economy, and later the National Education Association took up the movement. The ground had therefore been somewhat prepared when America entered the World War in 1917, and national thrift became an immediate and vital factor of the struggle. The government soon began an intensive thrift campaign that reached every home in the land. "Save and waste nothing" was circulated through the country by lectures, pamphlets, billboard advertising and moving pictures. Through the Liberty Loan flotations people learned to save money as never before. Day laborers, typists, bootblacks, scrubwomen, teachers, lawyers, doctors, the small salaried man and the millionaire—all joined the ranks of the bond buyers. No one knows how many people saved their first dollar when they made the initial payment on their first liberty bond. By offering thrift stamps at twenty-five cents each the government made it possible for even the small children to become savers. The response of the school children to the suggestion that they use their candy money to buy thrift stamps was surprising even to the most optimistic. Children and adults acquired the saving habit by investing in government securities, and this in itself was as important as the actual money gain, a point which is quite frequently overlooked.

The thrift campaign, however, was not confined to the urging of people to save in order to invest in government loans. A food administration department was organized, something unknown in American history, and people began to learn new methods in food economy. They were told that enough food was wasted in the average American kitchen to feed a small family, and were shown the need of conserving because of the pressing needs of the allies. Housewives became interested in butter, sugar and wheat substitutes, economy recipes came into being by the dozen, and new ways of utilizing scraps and left-overs were discovered. Some people found out that they were eating more than was either necessary or healthful, and others learned the merits of foods to which they were not accustomed. Extravagant America also learned that fuel could and must be saved, that pleasures could be curtailed and that clothes could be made over.

Teachers in the public schools have an excellent opportunity to correlate the thrift idea with the regular school subjects. The teaching of thrift is something that should be made permanent. In the lower grades the children may be given problems which bring out the idea of saving, and such phases of thrift as insurance and investment can be emphasized in connection with the arithmetic of the upper grades. In the language and English classes, thrift can be emphasized through story telling, essay work, etc. In connection with the geography lessons the importance of conserving natural resources may be brought out. Closely related to this branch is nature study work, in which gardening and elementary agriculture have a place. In the physiology lessons emphasis should be placed on the importance of keeping healthy, and instruction be given in the care of the body. Schools that give domestic science courses have a wide field for emphasizing thrift, and the idea may also be brought out forcibly through history and biography.

THRUSH, a group of about 240 species of singing birds, native to all parts of the world. They represent the highest order of songsters. None is very large and most of them have dark plumage, frequently spotted or striped, and with light or spotted under parts. They live in the wooded countries, chiefly on the ground, and in their habits they are generally solitary, though in the winter and in the season of migration they go in loose flocks.



WILSON'S THRUSH

Thrushes are celebrated for their powers of song. In the United States and Canada the *brown thrush*, or *brown thrasher*, is best known. It is rather slender and is brown

above, with lighter under parts, streaked with brown. Its song is loud, prolonged and clear. There are eight other species east of the Mississippi and the prairie provinces. Among them the *wood thrush*, or *veery*, the *hermit thrush* and *Wilson's thrush* are charming, but shy, inhabitants of the forests and shrubbery. In some localities the wood thrush is called the *wood robin*. See **ROBIN**.

THUCYDIDES, *thu sid' i deez* (about 470—about 400 B. C.), the greatest of the Greek historians, born in Attica, a member of an aristocratic family and the possessor of rich Thracian gold mines. For a time he was a prominent commander during the Peloponnesian War, but because of his failure to relieve the siege of Amphipolis, he suffered exile for about twenty years. However, he appears to have returned to Athens in 403 B. C., the year following the termination of the war.

His masterpiece, *A History of the Peloponnesian War*, consists of eight books, the last of which is believed not to have had his final revision because of its inferiority of style and abrupt ending. This monumental work covers the period from 431 to 411 B. C., twenty-one of the twenty-eight years of the war.

As a historian Thucydides was painstaking and indefatigable in collecting and sifting facts, and terse in narrating them. His style is dignified but at times obscure through its condensations. Thucydides is unsurpassed in the power of analyzing character and action, of tracing events to their causes, of appreciating the motives of individual agents and of combining in their just relations all the threads of the tangled web of history.

THUGS, the name applied to a secret and once widely spread society among the Hindus, whose occupation was to waylay, assassinate and rob all who did not belong to their own caste. This they did, not so much from their cupidity, as from religious motives, such actions being deemed acceptable to their goddess Kâli. The name is sometimes applied in America to "holdup" men, or highwaymen.

THULE, *thu'le*, or **ULTIMA THULE**, the name given by the ancients to the most northerly country with which they were familiar. According to some accounts, it was an island, six days' voyage to the north of Britannia, and, therefore it has often been identified with Iceland; other writers claim the name to have been given to one of the Scotch islands, or to the coast of Norway.

THURSDAY, *thurz'day*, Thor's day, the fifth day of the week, so called from the old Teutonic god of thunder, Thor. The American Thanksgiving Day is always designated the last Thursday of November, by precedent. The day before Good Friday is called Maundy Thursday and Holy Thursday.

THWAITES, *thwazts*, REUBEN GOLD (1853-1913), an American historian, born in Dorchester, Mass. He moved in 1866 to Wisconsin, where he later became editor of the *Wisconsin State Journal*, at Madison. Among his published volumes are *Down Historic Waterways*, *The Colonies*, 1492-1750, and several biographies. He has also edited a number of historical works, the best-known being *The Jesuit Relations*.

THYME, *time*, a small plant of the mint family, a native of the south of Europe, frequently cultivated in gardens. It has a strong aromatic odor and yields an essential oil, used for flavoring purposes.

TIAN-SHAN, or **THIAN-SHAN**, *te ahn'-shahn'*, a range of mountains in Central Asia, 1,500 miles long, extending in a northeasterly direction from the plateau of Pamir to the Desert of Gobi, and constituting the watershed between the basins of the Dzungaria and the Balkash. It is also closely linked with the Altai Mountains, and forms a part of the great transcontinental barrier, bordering on the northern edge of the central plateau of Asia. The central portion of the range, with its slopes always covered with snow, has an elevation of from 15,000 to 20,000 feet. Glaciers many square miles in extent are also found here in great numbers. The lower parts of the slopes, to an altitude of from 9,000 to 9,500 feet, are dense with forests. Numerous roads and passes over the mountains connect China, West Turkestan and Persia.

TIARA, the name given originally to the cap of the Persian kings, but now to the triple crown of the Pope. The tiara of the Pope is a high cap of gold cloth, encircled by three coronets, with an orb and cross of gold at the top. From either side hangs a fringed and embroidered pendant. The cap was first adopted by Nicholas I, in the ninth century, and later Popes added the coronet.

TIBER, the second largest river of Italy, 245 miles in length, rising in Tuscany, in the Apennines, and flowing southward into the Mediterranean by two mouths. The Tiber is noted for the large delta at its

mouth and for its historic associations. It traverses the city of Rome, forming the island anciently called *Insula Tiberina*.

To check the disastrous floods of past years costly embankments have been constructed at Rome. Because it deposits large quantities of yellow mud and sand, it is often known as the "Yellow Tiber;" the Romans also affectionately called it "Father Tiber." Through Rome it has been canalized, and it is also spanned there by a number of fine bridges. During high water it is navigable for about thirty miles north of Rome.

TIBERIUS (42 B. C.-A. D. 37), the second emperor of Rome, the son of Tiberius Claudius Nero. Tiberius became consul in his twenty-eighth year and was subsequently adopted by the Emperor Augustus as his heir. In A. D. 14 he succeeded to the throne, without opposition. Dangerous mutinies broke out shortly afterward in the armies posted in Pannonia and on the Rhine, but they were suppressed by the exertions of the two princes, Germanicus and Drusus.

Tiberius was a man of genius and his reign was characterized by an extraordinary mixture of tyranny with occasional wisdom and good sense. Tacitus records the events of the reign, including the suspicious death of Germanicus, the detestable administration of Sejanus, the praetorian prefect, and the retirement of Tiberius to the Isle of Capri, where he lived an infamous and dissolute life. Sejanus, aspiring to the throne, fell a victim to his ambition in the year 31; and many innocent persons were sacrificed to his suspicion and cruelty, for spies reported all that occurred in Rome.

TIB'ET, or **THIBET'**, called a dependency of China, but declaring its independence, is located in the center of the continent of Asia. It is surrounded on three sides by high mountains, including the lofty Himalayas to the south, and has an altitude of from 14,000 to 17,000 feet, comprising the most extended area of elevated plateaus on the globe. For this reason, Tibet is sometimes called "the roof of the world."

On account of its high altitude and rarified atmosphere, Tibet has an inhospitable climate, subject to great extremes of heat and cold. Violent winds sweep over the plateaus at all seasons. The western part is largely desert, rainfall being shut off by the mountains. The southern and eastern

parts are fertile, being watered by the upper courses of the Indus, Sutlej, Ganges and Brahmaputra rivers. The country contains numerous lakes, many of which, having no outlet, are salt.

The population of Tibet is sparse, numbering somewhat more than 3,000,000, two-thirds of whom live in the southeastern part, in the Brahmaputra valley. The main crops of the fertile regions are barley, wheat, buckwheat, potatoes, turnips, cabbages and pulse, with a few hardy fruits. Sheep and yaks are extensively raised, their owners taking them up the mountain sides during the short summer season for pasturage, and driving them down into the valleys as the cold becomes unendurable.

Tibet has no large industries, but the people are skilful weavers, embroiderers, and metal workers. They make a durable woolen serge which, with sheep skin, forms the chief material of their clothing. They export wool to China and India by trains of pack animals, bringing back in exchange, tea, cotton, silk, sugar, leather goods, etc. Mineral wealth is considerable, but has been little developed. Gold, silver, iron and coal are abundant; also turquoise, lapis lazuli and other stones. Salt, nitre and borax are valuable products.

The Tibetans, as indicated by their language, are of Mongolian extraction, though they have varied greatly from the original type, being largely mixed with the Chinese and the Indians of the bordering countries. Their religion, known as Lamaism, is an offshoot of Buddhism, modified by numerous primitive customs and superstitions. Polyandry is common, and polygamy is also practiced by the wealthier classes. The country supports large numbers of lamas, or celibate priests.

Because of its inaccessibility and its policy of isolation, Tibet, up to the beginning of the present century, was taken little account of by the outside world. China made little attempt at authority, and the Grand Lama, head of both Church and state, ruled unmolested from the capital at Lhasa. In 1904 the British government in India sent an armed expedition to Tibet, which compelled important trade concessions to Great Britain. This brought a protest from the Chinese government, which demanded China's recognition as the suzerain of Tibet. Lengthy negotiations followed, and by a

trade agreement made in 1908 Great Britain and Russia agreed not to enter into negotiations with Tibet except through the Chinese government. In 1911 Tibet revolted from China, and Great Britain denied China the right to send an expedition to reconquer the territory. In 1914 Great Britain and Tibet signed a treaty adjusting relations between the three nations which China refused to sign, being thereupon notified by Great Britain that until it signed it would be deprived of all rights it had hitherto enjoyed.

TIC DOULOUREUX, *tik doo loo roo'*, a form of neuralgia, which affects the facial nerve and is characterized by acute pain, attended with convulsive twitchings of the muscles. It occurs on one side of the face and may be caused by a diseased tooth, by inflammation in the air passage, by exposure, to cold, by dissipation and by other diseases. The natural remedy is removal of the cause, though sometimes warm applications will bring temporary relief. A local operation on the affected nerve is sometimes resorted to.

TICKS, a family of tiny eight-legged parasitic insects, with oval or rounded bodies, and with mouths in the form of suck-



TICKS, MUCH ENLARGED

Wood tick; a, mature dog tick; b, gorged with blood, viewed from above; c, viewed from below.

ers, by means of which they attach themselves to mammals and birds. They subsist on the blood of their victims. The common wood tick is widely distributed throughout the damp woods in the United States and Canada and is often very annoying to persons. It burrows into the flesh and generally is not noticed until gorged with blood, when it is difficult to remove. See ARACHNIDA.

TICONDEROGA, *ti kon der o'ga*, BATTLE OF, Ticonderoga is a village in Essex County, N. Y., noted as a battle ground in three wars. The first battle was waged in 1609, when Champlain won a victory over the

Mohawk Indians. In 1775 a powerful fortress was built near the site of the village by the French. It was held by Montcalm in 1757 and successfully resisted a vigorous attack by the British under General Abercrombie. It was captured by General Amherst for the English, after a long siege, in July, 1759. One of the first movements in the Revolutionary War was an American expedition against Ticonderoga, undertaken by a body of Green Mountain Boys, under Ethan Allen, and a force of continental troops, under Benedict Arnold. It was captured May 10, 1775, by Ethan Allen, without the loss of a man. It was on this occasion that Allen made his famous reply to the British general who inquired by what authority he demanded the surrender of the fort—"In the name of the Great Jehovah and the Continental Congress." Ticonderoga was retaken by Burgoyne in 1777, was later abandoned and was reoccupied in 1780. Ruins of the barracks and fortifications are still to be seen.

The village of Ticonderoga is about 100 miles north of Albany, on an elevated promontory, between Lake Champlain and Lake George. It is the center of a rich graphite region, and for years has furnished almost all of this material produced in the United States. Population, 1910, 2,475; 1915 (state census), 2,918.

TIDES, the periodical rise and fall of the water of the ocean, caused by the attraction of the sun and moon. The tide rises for about six hours, remains stationary for a short time, then begins to recede and continues to fall for the next six hours. The rise is called *flood tide*, and the fall, *ebb tide*. When the water has reached its height, it is called *high water*, and when it has reached its lowest point, it is at *low water*. Every place on the coast has two high and two low tides during the twenty-four hours; but the mean interval between successive high tides is about twelve hours and twenty-six minutes, and the hour of the day at which high or low water is greatest is later each day by about fifty-two minutes.

Tides are caused by the attraction of the sun and moon, but the moon, being so much nearer the earth, exerts by far the greater influence, notwithstanding it is much smaller than the sun (see GRAVITATION). This attraction causes a rise of water, or *tidal wave*, nearest the moon; and as the earth rotates

on its axis, the tendency of this wave is to keep directly under the moon. Hence, it travels from east to west, but it lags somewhat behind the moon, on account of the time required to draw the water into its position. Since the attraction of bodies decreases as the square of the distance between them increases, it follows that the points of the moon's greatest and least attraction are at those points on the earth's surface which are respectively the nearest

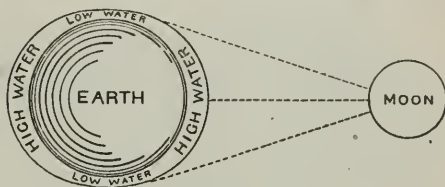


FIG. 1

and the farthest from the moon. At the former point the attraction is greater than the average, and the water is pulled up toward the moon; the solid portions of the earth are attracted the same as the water, so the earth as a whole is drawn toward the moon, away from the point on the opposite side where the attraction is less than the average. The pressure of the water upon either side of this pushes the water up on the side near the moon and forms a tidal wave, which balances that on the opposite side. Therefore we have high tide at the opposite ends of the long diameter of the ellipse, and low tide at the points midway between.

Twice a month, at new and at full moon, the attraction of the moon and sun is combined to act upon the tides at the same points, and the highest tides of the month occur. This is known as *spring tide* and is illustrated in Fig. 2. Near the first and fourth quarters of the moon, the earth, sun and moon are in such relative positions that

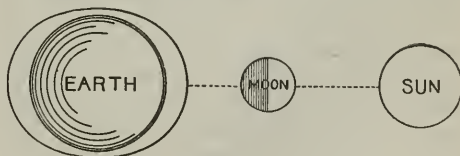


FIG. 2

the attractions of the sun and moon act nearly at right angles upon the earth and we have the lowest tide, called the *neap tide*. This is illustrated in Fig. 3.

In the open ocean the tidal wave is merely a broad swell that is scarcely perceptible, but on the coast its height varies according to

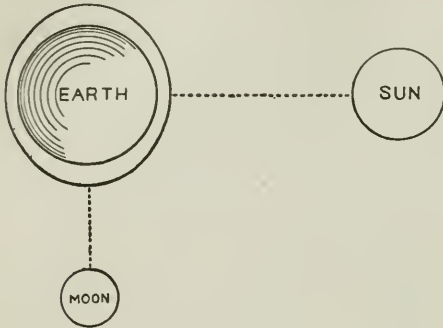


FIG. 3

the coast line and the character of the locality. If the coast contains inlets, which narrow towards their head, like the Bay of Fundy, the tidal wave grows higher as it is shortened by the converging shores, and the tide rises very high. If the coast contains a promontory or other projection, which divides the tidal wave, as the Florida peninsula, the tendency is to lower the tide. Because of the irregularity of the coast and of the bed of the ocean, tides do not occur at all places on the same meridian at exactly the same time. Mariners' charts contain the variations in tide for all harbors and are frequently accompanied by tables, which give the time of the tides for each harbor and each month in the year.

TIEN-TSIN, *tyen'tsin*, CHINA, is situated on the Pei-ho, where the river forms a junction with the Grand Canal, seventy miles southeast of Peking, with which it is connected by railway. The city is surrounded by high walls, which are surmounted by towers. The houses in the Chinese quarter are low, and the streets are unattractive. The foreign quarter, which is outside of the Chinese city, is well built and resembles a modern European or American town in nearly all respects. Tien-tsin is an important trade center and one of the chief seaports of China. It has railway connections with the coal district of Kaiping, Manchuria and Hankow, and is open to vessels of the leading European nations and the United States on equal terms. During the Boxer outbreak in 1900, Tien-tsin was the point from which the relief expedition of the allied powers started for Peking. Population, estimated, 800,000.

TIERRA DEL FUEGO, *tyer'ah del fwa'go*, a group of islands situated off the southern extremity of South America, from which the archipelago is separated by the Strait of Magellan. It consists of a large island, called King Charles South Land, and several smaller islands west and south of it, the total area being about 27,000 square miles. All the islands are mountainous, and the climate, modified by warm currents, is habitable, the population numbering about 2,500. There are forests and pasture lands, and agriculture and cattle-raising are the chief occupations. Politically the archipelago is divided into two groups. The eastern part, including the largest island of the group and Staten Island, belongs to Argentina; the western, to Chile. On one of the small islands of the Chilean group is situated Punta Arenas, the most southern city in the world; and on another, the southernmost of the group, is Cape Horn.

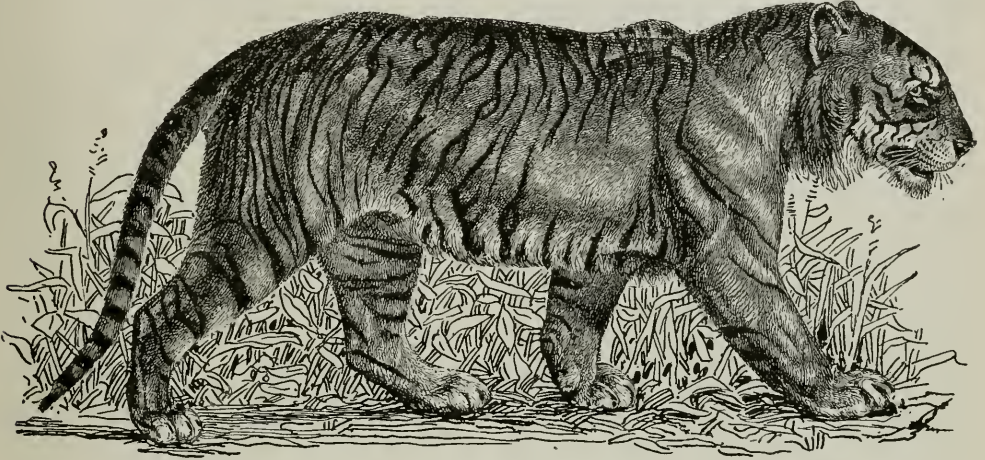
TIF'FIN, OHIO, the county seat of Seneca County, forty miles southeast of Toledo, on the Sandusky River, and on the Pennsylvania, the Baltimore & Ohio and the Cleveland, Cincinnati, Chicago & Saint Louis railroads. It is the seat of Heidelberg University, the College of the Ursuline Sisters and a school of music. The city has a Federal building, a Carnegie Library, a fine soldiers' monument and the national orphan's home of the Junior Order of United American Mechanics, housing about 400 children. There are deposits of clay and glass sand in the vicinity, and the industrial establishments include machine shops, glass works, potteries, woolen mills and mitten factories. The place was settled in 1817 by Erastus Bowe, and was chartered as a city in 1836. Population, 1910, 11,894; in 1917, 12,962 (Federal estimate).

TIFLIS' (Russian pronunciation *tyee flyees'*), the capital of Russian Transcaucasia, situated on both banks of the Kur, 275 miles northwest of Baku, with which it is connected by railway. The city occupies a beautiful valley, at the foot of the Caucasus Mountains and is interspersed with numerous vineyards and orchards. The Russian part of the city is built on modern plans and contains good hotels, stores, theaters and other buildings, resembling those of the cities of Western Europe. The native quarter is typically Oriental. The public gardens and botanical garden

are objects of interest, and the educational institutions include a conservatory of music, a railroad institute, a physical observatory and the Caucasian Museum. Manufactures include tobacco, leather and cotton yarn.

TIGER, the largest and most powerful animal of the cat family. It is about the height of the lion, although the body is longer and more slender, while the head is more rounded and has no trace of a mane. The males are considerably larger than the

TIGER LILY, a tall garden plant brought to America from Eastern Asia, its early home. Its markings are somewhat similar to those of the tiger, and it is so named for this reason; the blossoms are orange-red, splashed with black. The plant grows from bulbs which in Japan and China are used as food. It often attains the height of five feet and bears alternate, lance-shaped, deeply-veined leaves. At the point where the leaves join the stalk, small black bulblets grow, which, after cling-



TIGER

females, and leave a more nearly square and less oval footprint. The average length of the male is about $9\frac{1}{2}$ to 10 feet from the nose to the tip of the tail; the average weight is 500 pounds. It is of a bright fawn color above and a pure white below, crossed irregularly with black stripes. Its colors prevent it from being easily seen in the shades of the jungles.

The tiger attains its full development in India, the name of *Bengal Tiger* being generally used as synonymous with those specimens which represent the typical and most powerful of the species. It generally selects the neighborhood of water courses as its home and springs upon the animals that approach to drink. *Man-eaters* are tigers that have acquired a special liking for human prey.

The tiger combines with the strength of a lion, a fierceness, stealth and activity peculiar to itself, so that natives fear it more than any other animal. The natives destroy tigers by means of poisoned arrows or capture them in grass-covered pits and other traps.

ing to the stem for a while become detached and take root to produce other plants, which bloom in two to three years. See *LILY*.

* **TIGRIS**, a river which, with the Euphrates, encloses the historic region of Mesopotamia. In its valley flourished two great civilizations—the Assyrian and Babylonian—long before the glorious days of Greece. Its principal sources start on the slopes of the Anti-Taurus Mountains in Central Armenia. After the junction of the headwaters the river flows in a winding southeast course of about 950 miles, uniting with the Euphrates at Garmat Ali. The two streams form the Shat-el-Arab, which enters the Persian Gulf after a ninety-mile course. Although it is shorter than its sister stream, its volume is greater, its flow swifter. Its chief branches are on the eastern side; the largest of these are the Diyala and the Greater Zab. In its course the Tigris passes the ruins of Nineveh, on the east bank, opposite the modern town of Mosul. Lower down it flows through Bagdad and farther on passes the ruins of Ctesiphon, then those of Seleucia, in splendor once the

rival of Babylon. Ocean craft ascend to Bagdad; smaller vessels may go to Mosul. The valley of the Tigris was the scene of desperate fighting in the course of the World War. See MESOPOTAMIA.

TIL'DEN, SAMUEL JONES (1814-1886), an American statesman and philanthropist, born in New Lebanon, N. Y. He was educated at Yale College and at the University of the City of New York and was admitted to the bar in 1841. He was elected to the state assembly in 1845, where he advocated the construction of canals by the state, and in 1846 he was a member of the State Constitutional Convention. By 1868 he had become the leader of the Democratic party in New York State. His determined opposition and practical measures broke up the "Tweed Ring" (see TWEED, WILLIAM MARCY), the prosecution of which he successfully conducted.

Tilden was elected governor in 1874, served the state with sagacity and honesty and in 1876 was the Democratic nominee for President against Rutherford B. Hayes. He received a majority of the popular vote and was defeated in the Electoral College by one vote, after a long dispute over returns, which was decided by an electoral commission (see ELECTORAL COMMISSION). The greater portion of his fortune, estimated at \$5,000,000, he bequeathed for the endowment of a public library in New York City, but after a long contest over the will, only about \$2,000,000 was so applied.

TILE FISH, a deep-sea fish accidentally discovered in 1879 by fishermen trawling for cod in warm currents near Nantucket. In 1882 these fish were nearly exterminated by the cold waters which the gales of that year forced into the warmer currents inhabited by them. Their dead bodies were seen floating in countless thousands on the ocean surface. Since then their numbers have been gradually increasing. The flesh is finely flavored, and is excellent food. The fish has a large head, is brilliantly-colored and has an average weight of fifteen pounds. A peculiarity is a fleshy protuberance on the top of the head. The name is adapted from the long scientific name of the fish, which means *crested tilus with a chameleonlike head*.

TILES, *til'e'z*, a term applied to a variety of articles, made either for ornament, such as inlaid paving tiles, or for use, as draining and roofing tiles. The latter are made

similarly to bricks and of similar clay (see BRICK). Floor tiles in which the body of the tile is in one color and a special pattern is produced by the use of other colors, are known as *encaustic tiles*. When designs in floors or walls are made by the arrangement of tiles of different colors, the result is said to be a *mosaic*.

TILL'MAN, BENJAMIN RYAN (1847-1918), an American Senator, famous in the past generation, was born in Edgefield County, S. C. He received an elementary education, but left school in July, 1864, to join the Confederate army, in which he did not serve long, because of loss of sight in one eye. After the war he became a planter in his native state; in 1886 he entered politics as the champion of industrial and technical education, and succeeded in securing the establishment of several schools, the largest of their kind in the South. He gained a large following as an advocate of other reforms and was elected governor in 1890. He was reelected in 1892, his administration being important by reason of the passage of the state liquor dispensary law. In 1895 he was elected United States Senator, and was subsequently reelected for four terms. His fiery and enthusiastic speeches, especially his attacks upon President Cleveland in 1895-1896, won him the title, "Pitchfork Ben."

TIL'LY, JOHANN TSERKLAES, Count of (1559-1632), one of the most celebrated generals of the seventeenth century. He was born at the castle of Tilly in Belgium and received his military training in the Spanish armies. In 1610 he was selected by Duke Maximilian of Bavaria to reorganize his army, and at the outbreak of the Thirty Years' War he was made commander of the forces of the Holy League. In 1620 he gained the victory of White Mountain, near Prague, and in 1621 he subdued Bohemia. In the years that followed he overpowered Christian IV of Denmark, who had entered the war on the side of the Protestants and forced him to withdraw. Tilly became commander of the imperial army in 1630, and in 1631 he stormed Magdeburg. This, his thirty-sixth victory, closed his list of triumphs. On Sept. 17, 1631, he was defeated by Gustavus Adolphus at Breitenfeld, near Leipzig, and in the next year, in a contest with the Swedish king, near the Lech, he was mortally wounded.

TIMBUK'TU, or **TIMBUC'TOO**, a town of French West Africa, situated on the south-

ern edge of the Sahara Desert, nine miles north of Kabara, its port on the Niger river. It is notable as being the center of caravan trade between North Africa and the regions south and west of the Niger. Gums and rubber, gold; ivory, ostrich feathers, wax, salt, hardware and cheap cloth, to the value of millions of dollars annually, are exchanged here, mainly by barter. The buildings of Timbuktu are chiefly one-story mud hovels, though the city contains a number of beautiful mosques, one of which dates from 1325, and a number of European churches and schools. The town was founded in 1077 by the Tuareg tribe, and has long been a center of Mohammedan learning. It passed into possession of the French in 1894.

TIME, STANDARD. See **STANDARD TIME.**

TIM'OTHY, a coworker with the Apostle Paul, probably born in Lystra, in Asia Minor. His father was a Greek, and his mother was a Jewess. He went with Paul to Philippi and Beroea and remained alone in the latter city, afterward rejoining the apostle at Athens, from which he was sent to Thessalonica. After remaining there some time, he joined Paul at Corinth. Five years later, he was at Ephesus, whence he was sent with Erastus into Macedonia and Achaia, to prepare the churches for Paul's meditated visit. Timothy met the apostle in Macedonia and preceded him on his journey to Jerusalem. He was at Rome with Paul at the time when the epistles to the Colossians, Philippians and Philemon were written. He is said to have been martyred in the reign of Domitian or Nerva.

TIMOTHY, or **CAT'S TAIL**, once called herd's grass, is a grain of high economic value, widely cultivated for fodder. It grows to a height of from one to three feet and bears, on the tips of slender stems, cylindrical spikes composed of tiny florets. The plant is perennial, but springs from seed and matures rapidly in the same season in which it is sown, if conditions are favorable. The yearly production of timothy, alfalfa and clover in the United States at normal prices is valued at over \$1,000,000,000; in Canada, \$150,000,000 to \$170,000,000.

TIMROD, HENRY (1829-1867), a lyric poet of the Southern states, native to Charleston, S. C. He contributed poems to *Russell's Magazine* and the *Southern Literary Messenger* during the years preceding the Civil War, published a volume of poems in 1860,

was war correspondent for the *Charleston Mercury*, and during the war was assistant editor of the *South Carolinian*, published in Columbia. His property and health were swept away in the Federal attack upon Columbia, and he died in great physical suffering and poverty. An edition of his poems was published in 1873, and a revised memorial edition was issued in 1899.

TIMUR, *te moor'*, generally known as Tamerlane (1336-1405), was a celebrated Asiatic conqueror born near Samarkand. His ancestors were chiefs of his native district, and Timur, by his energy and ambition, made himself ruler of all Turkestan (1370). By degrees he conquered Persia and the whole of Central Asia, and extended his power from the Great Wall of China to Moscow. He invaded India in 1398, and overran it from the Indus to the mouths of the Ganges, massacring, it is said, on one occasion, 100,000 prisoners. After this he marched on Asia Minor and successfully made war on the Turks, subjugating Bagdad, plundering Aleppo, and burning Damascus. He then undertook to conquer China, but died in camp of fever. He was fanatical in his devotion to Mohammedanism, well versed in the Koran, but was one of the most cruel of warriors. In times of peace he was a patron of science, art and letters.

TIN, a hard, white, ductile metal. It appears to have been known in the time of Moses; and the Phoenicians traded largely in the tin ores of Cornwall. The mountains between Galicia and Portugal, and those separating Saxony and Bohemia, have also been productive of tin for centuries and still continue unexhausted. Tin is found in great quantities in the Malay Peninsula, the island of Banca, India, Mexico, Chile, Peru, Bolivia, the United States, Australia and other countries, but the most important mines are at Cornwall, England, and on the Malay Peninsula. From the latter, nearly half of the world's supply has been obtained for many years past, but the output is now declining. The annual output for the world is about 135,000 tons.

Metallurgy of Tin. There are only two ores of tin, the native dioxide, called *tin stone* and *cassiterite*, and the double sulphide of tin and copper, called *tin pyrites*. The former is the only ore used for obtaining metallic tin. It occurs in various crystallized forms—in deep lodes blended with several other

metals, as arsenic, copper, zinc and tungsten, when it is known as *mine tin*, or in disseminated masses in alluvial soil, in which state it is called *stream tin*. Mine tin, when reduced to the metallic state, yields *block tin*, while stream tin yields a purer sort, called *grain tin*.

Its Preparation for Commerce. The ore is first ground and washed and is then roasted in a reverberatory furnace, to expel the sulphur and arsenic. Mixed with limestone and fuel, it is again melted in a furnace for about eight hours, the earthy matters flowing off with the lime, while the oxide of tin, reduced to a metallic state, falls by its own weight to the bottom and is drawn off. The tin, still impure, is then moderately heated, when it melts and flows off into the refining basins, leaving the greater part of the foreign metals in a solid state. The molten tin is stirred, to disperse the gases, and when partially cool, it separates into layers, the upper consisting of nearly pure tin, while the under is so impure that it again must be melted. The upper layer is removed, cast into blocks and sold as *block tin*, the purest specimens being called *refined tin*.

Pure tin has a fine white color like silver and is a little more than seven and one-fourth times heavier than water. It has a slightly disagreeable taste. Its hardness is between that of gold and lead, and it is very malleable. Tin is flexible, and when bent emits a crackling sound, sometimes called the *cry of tin*. It loses its lustre when exposed to the air, but undergoes no further alteration.

Its Properties. Tin will unite with arsenic and with antimony, but does not readily combine with iron. Combined with copper it forms bronze, bell metal and several other useful alloys. With lead it forms pewter and solder of various kinds. *Tin plate* is formed by dipping thin plates of iron into melted tin. These are afterward cleaned with sand and steeped for twenty-four hours in water, acidulated by bran or sulphuric acid. Tin is principally employed in the formation of alloys. Its oxides are used in enameling and for polishing metals, and its solution in nitro-muriatic acid is an important mordant in the art or dyeing rendering several colors more brilliant and permanent.

Tin foil. Tin hammered into thin sheets is called tin foil, although much of the tin foil now contains lead. It is used to wrap small articles, such as fine soaps, tobacco, yeast, etc., to protect them from air and moisture.

TINTORETTO (1518-1594), whose real name was JACOPO ROBUSTI, was one of the greatest painters of the Italian Renaissance. His father was a Venetian dyer, and the nickname Tintoretto means *little dyer*. He studied under the greatest painters of his day, but was largely self-taught, subjecting himself to the most severe course of training. He dissected bodies to learn anatomy and worked by daylight and by lamplight to study light effects. His output was prodigious, and his works are numbered by hundreds. They are to be seen in all the great galleries and include mythological, religious and historic subjects, many of them unusually large pieces. His *Paradise*, occupying an entire wall in the old Ducal Palace, Venice, is the largest oil painting in the world.

Tintoretto established his reputation with a series of pictures on the subject of Saint Mark, the patron saint of Venice. One of these, *The Miracle of Saint Mark*, in the Academy, Venice, was pronounced, by the art critic Taine, the greatest painting in Italy. It is remarkable for intense dramatic action, exquisite color, fine modeling of the figures and masterly treatment of light. For the guild house of San Rocco he did some of his finest work, including a magnificent *Crucifixion*, *Paschal Feast* and *Moses Striking the Rock*. Among his last religious pictures was a series depicting scenes in the life of Christ. Some of these are *The Visitation*, *The Annunciation*, *Christ Before Pilate*, *Ecce Homo* and *Resurrection*. A number of his most charming pieces illustrate pagan and Christian myths. Only a few of his works may be seen in America. *The Doge in Prayer Before the Redeemer* and *Miracle of the Loaves and Fishes* are in the Metropolitan Museum, New York, and a canvas entitled *Senator*, is in the Gardner Collection, Boston.

TIPPECANOE, *tip pe ka noo'*, BATTLE OF, a battle fought November 7, 1811, near the site of the present village of Battleground, in Tippecanoe County, Ind., between a force of 800 Americans, chiefly Indiana and Kentucky militiamen, under General William Henry Harrison, and a force of Indians, estimated at about 6,000, under the command of chiefs White Loon, Stone Eater, Winnemac and the Prophet, the last a brother of Tecumseh. Tecumseh and the Prophet had created much discontent among the Indians of the Northwest, and General Harrison had finally found it necessary either to secure a

treaty with them or to subdue them by force. He finally proceeded to their headquarters at a village on the Tippecanoe and arranged for a meeting with the Prophet, but before the conference could be held the Indians had attacked the American camp. After a fierce contest, lasting more than two hours, the Indians were driven from the field, and their village was completely destroyed by the Americans. The battle led to a general uprising of the Indians in the Northwest, in connection with the War of 1812. General Harrison gained such prestige in this campaign that he was made commander of the American troops in the West.

TISSOT, *tis so'*, JAMES JOSEPH JACQUES (1836-1902), a French painter, born at Nantes, famous chiefly for a series of water colors, more than three hundred in number, illustrating the life of Christ. These, the result of ten years' study in the Holy Land, depart widely from the conventional treatment of religious subjects in the attempt to show Christ's actual surroundings, the supposition being that Palestine has changed little since his time. The collection is owned by the Brooklyn Institute. Tissot did not begin to paint religious subjects until after he was fifty, and then chose them as the result of a spiritual conversion. Prior to this event he had devoted his talents to representing scenes of Parisian life. At the time of his death he was engaged upon a series illustrating scenes and incidents in the Old Testament.

TISSUES, *tish'uze*, the organized collection of cells of the same sort, or fibers, of which the systems of organs are composed. Thus, we speak of *muscular tissue*, or flesh; *osseous tissue*, or bone; *adipose tissue*, or fat; *cartilaginous tissue*, or gristle; *pigmentary tissue*, or coloring matter seen in the skin; *areolar, cellular, or connective tissue*, which is widely distributed in every part of the body and serves to bind together and consolidate other parts and tissues. See BONE; CARTILAGE; CONNECTIVE TISSUE.

TITANIC, a steamship of the White Star Line which sank after colliding with an iceberg, causing one of the greatest marine disasters of all time. At the time of its launching the *Titanic* was the largest ship afloat (see SHIPS). It was making its first voyage, and on April 14, 1912, had reached a point about 1,000 miles southeast of Halifax. Here it collided with an iceberg and sank four hours later, early in the morning of

April 15. The *Carpathia*, hearing the *Titanic's* wireless calls for help, rushed to the scene in time to pick up the lifeboats with 745 passengers, but 1,595 persons went to their death.

TITANIUM, a metallic element discovered in 1789. It is not found native, but as an oxide in other minerals. Combined with silver it gives luster to that metal; combined with steel it adds hardness and toughness. When heated in air it burns with an intensely brilliant light, and is used in the manufacture of filaments for incandescent lamps, and with carbon in arc lights, to increase the brilliancy of the illumination. Titanium salts are used in dyeing, while certain compounds of titanium are used as ingredients of paint for protecting iron from the air. This element is widely distributed, though nowhere abundant. It is found in many iron ores, and in the United States is extracted from rutile.

TITANS, in Greek mythology, the giant sons and daughters of Uranus (Heaven) and Gaea (Earth). Six were men and six were women, the latter called Titanides. Uranus feared them and chained them in a dark cavern of the earth called Tartarus. Saturn, the youngest, escaped, overthrew Uranus and released his brothers and sisters. Saturn was in turn overthrown by his son Jupiter.

TITHES, a tenth part of the profit derived from the use of land, which from the earliest times has been the common tax rate for civil and religious purposes. Moses levied upon the Jews a tax of one-tenth of their possessions for the support of the priests. In Christian churches tithes have been one of the methods employed for the support of the clergy. In England tithes are paid in support of the parish in which the land is held. In the United States the only tax levied for religious purposes is that which the Mormon Church exacts of its members.

TITIAN, *tish'an*, or **VECELLIO**, TIZIANO (1477-1576), one of the world's greatest masters of color and head of the Venetian school of painting. He was born at Pieve de Cadore, in the Carnic Alps. He studied under Giovanni Bellini of Venice, and later, in 1507, became associated with the painter Giorgione in the execution of certain frescoes. So closely did he imitate the latter's manner that his works were sometimes taken for those of this master.

About 1511 Titian began to work along independent lines. In that year he went to

Padau, where he executed three remarkable frescoes, still to be seen, and painted the pictures *Tribute Money* and *Sacred and Profane Love*. In 1530 Emperor Charles V invited him to Bologna to paint his portrait; thereafter his life was a succession of triumphs, and most of the foremost personages of his day were eager to sit for him.



TITIAN

Titian excelled as much in landscape as in figure painting, and was equally great in ideal heads and in portraits, in frescoes and in oils. As a colorist he is almost unrivaled, and his pictures often reach the perfection of sensuous beauty. He died at the age of 100 years and was buried in the Church of the Frari, in Venice. Among his principal productions are *The Entombment*, *The Assumption of the Virgin*, *The Crucifixion*, *Descent from the Cross*, *Mater Dolorosa*, *Christ Crowned with Thorns* and *Rape of Europa*.

TITICACA, *tit e kah'kah*, LAKE, the largest lake of South America, picturesquely situated, partly in Peru and partly in Bolivia. It occupies the center of a lofty valley and is surrounded by the mountains forming the main chain of the Andes. It is 130 miles long and thirty miles wide at its widest point; its area is about 5,000 square miles, and its height above sea level, 12,500 feet. Titicaca contains several islands, is fed by a number of mountain streams and discharges through the Desaguadero River, which flows from its southern extremity. The region around the lake contains many interesting architectural ruins of the old empire of the Incas. Small steamers ply between the ports of Puna, in Peru, and Guaqui, in Bolivia, and supplement the railway connections.

TITLE, *t'vl*, that which constitutes the legal ownership of property. It has two essential elements, possession and right of possession, and may be obtained by original acquisition, as in the case of patent or copyright; by gift, contract or sale, or by act of law, as in bankruptcy, judgment, intestacy or marriage.

In most countries a system of examination and registration of titles by a recognized officer exists, which assures the purchaser of real estate a perfect title without personal investigation. See **TORREN'S SYSTEM**; **DEED**.

TITLES OF HONOR, words or phrases attached to the names of certain persons, in virtue of particular offices or dignities possessed by them, or as marks of distinction and special rank. They have existed probably among all peoples. Such were, in Rome, the titles *Magnus* (Great) and *Africanus* (African), and the epithets *Caesar*, the name of a family, and *Augustus*, which were gradually applied to all who filled the imperial throne. In modern times such designations as prince, duke, king, lord, Royal Highness, His Excellency, are common.

TITMOUSE, TIT, or TOMTIT, a group of small hardy birds, characterized by long, soft plumage, of which a number of different species inhabit most parts of the world. They flit continually from branch to branch, devouring insects' eggs and larvae, thus rendering incalculable service. The tits live in trees or bushes, and hop, climb or cling, often with head downward, prying into crevices in the most curious manner. Their shrill and wild notes are sometimes varied by pleasing musical sounds.

In the United States the birds are known as *chickadees*, a name given in imitation of their calls. The *black-capped chickadee* is one of the most familiar and characteristic of northern birds, everywhere a great favorite, particularly as it often stays in rather cold latitudes throughout the winter, when its cheery exclamations are especially welcome. This chickadee is a very sociable, friendly bird; with little care it may be kept about quiet homes, and if coaxed will feed from the hand.

TITUS (40-81), a Roman emperor, the eldest son of Vespasian. He served with credit as a military tribune in Germany and Britain, and as commander of a legion accompanied his father in the war against the Jews. When Vespasian became emperor (69), Titus was left to conduct the war in Judea. He took Jerusalem (A. D. 70), and after visiting Egypt returned to Rome in triumph and was associated with his father in the government of the Empire. He became sole emperor in 79 and won distinction as an enlightened and generous ruler. He was hailed by the populace as "the Friend and the Delight of Mankind."

Arch of Titus, a Roman triumphal arch built by Domitian in A. D. 81, to commemorate the taking of Jerusalem by Titus. It is adorned with reliefs representing various scenes in the campaign, and is located on the Sacred Way, facing the Forum.

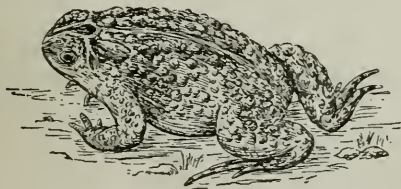
TITUS, a disciple and assistant of the apostle Paul; the person to whom one of the canonical epistles of the New Testament is addressed. He was a Gentile by origin and was probably a native of Antioch.

Epistle to Titus, one of the three pastoral epistles of the New Testament, believed to have been written by Saint Paul after his first imprisonment at Rome.

T. N. T. See TRINITROTOLUOL.

TOAD, *tode*, the name applied to various genera of tailless amphibians, which dwell in damp, shady parts of gardens or fields. Toads have thick, bulky bodies and short legs and are covered with warty excrescences. They have neither teeth nor ribs, and their skin absorbs the water they drink. Toads leap clumsily and generally avoid the water except in the breeding season. Their food consists of insects and worms, which makes them of great service to the farmer and gardener. They capture their prey mainly during twilight and at night. Insects are caught by a sudden shooting out of the tongue, which is provided with a sticky fluid. Like frogs, their young pass through the tadpole stage.

The *North American* toad is usually brown or green, and is found both on dry land and in swampy regions. The bite and saliva of



TOAD

the *common toad* of Europe were formerly considered poisonous, but no venom or poison apparatus of any kind exists in these creatures. The toad is easily tamed and exhibits a considerable amount of intelligence as a pet.

TOADSTOOL. See MUSHROOMS.

TOBACCO, *toh bak' o*, a plant of the nightshade family, extensively cultivated for its leaves, which are used for smoking and chewing and for snuff. There are several species, but that known botanically as *Nicotiana tobacum* is the one most extensively culti-

vated. It has an erect stem, that grows from four to six feet high and produces at the top a cluster of small, rose-colored flowers. The leaves are the important part of the plant. They are oblong and pointed and grow di-



TOBACCO

rectly from the stalk, often attaining a length of eighteen to twenty-five inches and a breadth of eight or ten inches. The plant is slightly poisonous, owing to the presence of nicotine.

Cultivation. Early in January the beds are covered with fertilizers, and then the seed, which is like a quantity of ground black pepper, is carefully and evenly sown over the ground and whipped in with a brush. A little while after the seed is sown, the bed is covered over with a flimsy cotton fabric, of lighter weight than cheese cloth, to guard against and equalize the frequent changes of weather at this season of the year, and as a protection against the flea bug, which would entirely destroy the young plants as soon as they show above ground. Forty days' time is required for the tobacco to sprout. The plants are large enough for transplanting early in May. The ground is thoroughly pulverized and is laid off into furrows four feet apart, into which the fertilizer is drilled. Then every three feet in the row a hill, or *pot*, is made.

The plants are distributed into the pots, and the dirt is settled tightly around the young plant. One good workman will set two acres a day. When the plant is about six weeks old, it is topped to ten or twelve leaves, and almost immediately false leaves, or *suckers*, start at every joint, beginning at the bottom. As many as three successive sets of suckers will start at the base of every leaf, and as these detract from the proper growth of the leaf, it is necessary to go over the crop each week until cutting time and pull off every new sucker.

Harvesting and Curing. In about three months after planting, the tobacco is ready to cut. When ripe, the green is dappled over with slightly yellow spots. A strong knife, similar to a butcher knife, is used for cutting. As the plants are cut, half a dozen of them are hung over a stick and laid on the ground. These sticks are taken up into a wagon and hauled to the barn. Inside the barn are two furnaces, which are arranged to be fired from the outside of the building. The flues to these furnaces are nearly horizontal and extend back and forth across the inside, to economize the heat better. Sets of horizontal poles, one above another, run across the interior, from which the sticks of green tobacco are suspended. When the barn is full, the doors are closed and the fires are started and are kept burning for four days. Beginning with a very low temperature, the heat is increased to about 100° by the end of the first twenty-four hours. Too sudden heat blackens the stems and otherwise affects the color. Beginning with the second day the temperature is increased about a degree an hour until 125° is reached, and it is held at this temperature from eight to twelve hours, after which the thermometer is started upward again, until 130° is reached, and the heat is held at that until it is noted by frequent examination that the stem of the tobacco is thoroughly killed. Then the fires are drawn, and a quantity of water is thrown in upon the ground, the vapor from which puts the brittle leaves in condition to be handled without injury. The tobacco is then taken out and stored. The lighter and even the color, the higher price it brings in the market. Some of the best varieties raised in Connecticut and Florida are grown under raised covers of cheesecloth, supported on frames.

Manufacture. The most important manufactured products of tobacco are cigars,

cigarettes, smoking tobacco, chewing tobacco and snuff. Tobacco manufacture is an important industry in the United States, Cuba and a few countries of the East. The United States government derives over \$100,000,000 revenue yearly from the tobacco manufactured in the country. The manufacture of cigars is the most important branch of the industry.

The first step in the manufacturing process consists in cleaning and stripping the leaves. Chewing tobacco is flavored with licorice, sugar, vanilla, etc. Pipe tobacco is finely cut and put up in small sacks or cans.

Cigars are made from leaves carefully selected for the purpose. The cigar consists of the core or "filler," the inner cover and the outer cover, or wrapper. The leaves must be of uniform quality, and those for the wrapper must be so shaped that they can be wound spirally.

Cigarettes are small rolls of tobacco encased in paper. They are fully described in these volumes under their titles.

Effects of Tobacco. As stated above, tobacco is a slightly poisonous plant, and its use in excess is injurious to the system, although it is generally conceded that a moderate use of tobacco is not injurious to adults. Excessive use long continued is likely to lead to irregular heart action, or cause "tobacco heart;" to benumb the nerves and cause loss of appetite, and to dull the sense of taste. Tobacco is a mild narcotic, and to this property is due the soothing effect of the cigar or pipe, but the reaction that follows is not always so soothing. Those accustomed to the use of tobacco are likely to become irritable when deprived of it for any length of time. The use of tobacco by growing boys cannot be too strongly condemned. This subject is fully treated under CIGARETTE.

Production. The United States is the largest producer, manufacturer and consumer of tobacco. The tobacco crop of the country in 1918 amounted to 1,196,451,000 pounds, valued at over \$297,440,000. The leading states, in the order of production, are Kentucky, North Carolina, Virginia, Ohio and Tennessee. Canada produces about 6,000,000 pounds a year; Japan over 100,000,000 pounds; the Philippines, a little less. Then follow Brazil and Cuba.

History. There is a tradition that credits the Chinese with using tobacco long before the discovery of America. Be this as it may,

tobacco was introduced into Europe from America, where Columbus learned of its use from the Indians. It was used in Spain and Portugal as early as 1560, and smoking became popular in England about twenty-five years later. From these countries its use spread over Europe. It is extensively used throughout Egypt, the Turkish domains, India, China and Japan. The origin of the name is unknown, but it is supposed to be derived from *Tobago*, the name of an island near Trinidad.

Related Articles. Consult the following titles for additional information:

Anti-Cigarette League	Nicotine
Narcotic	Snuff

***TOBOG'GANING**, coasting on a toboggan, that is, a sled without runners. Originally the Indians of Lower Canada used these toboggans to carry loads over soft snow. Slabs of birch about a quarter of an inch thick are fastened together side by side to make a single board, four to eight feet in length. This is curved upward at the forward end, and hand rails are placed along the side, for the coasters to cling to. The toboggan is steered with the foot or with short sticks held in the hand. In hilly countries, natural slides may be used, but artificial ones are constructed in level countries. The latter are great frameworks of timber, 40 or 50 feet high, from which a slideway, of one or more chutes, packed with ice or snow, runs down to a long level snow- or ice-packed track. The speed attained on these is very high, and the sport an exciting one. In many cities of the northern states, public toboggan slides are erected in the parks; but these are now used more by children and youths with sleds and bobs, than by tobogganists. See COASTING.

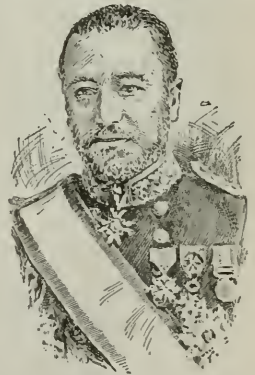
TOBOLSK, SIBERIA, chief city of the province of the same name, situated at the junction of the Irtysh and Tobol rivers and at the terminus of the North Siberian Railway. The main industries are fishing and fur dressing. Since the construction of the Trans-Siberian Railway the city has declined as a commercial center, but it still retains much of its river trade. It was founded in 1857, and it is inseparably connected with history of Russian exile in Siberia. Population, 1913, 24,800. See SIBERIA.

TOCANTINS, *to kan teens'*, a river of Brazil, which rises in the south central part of the country, flows northward and enters the southern mouth of the Amazon, generally known at this point as the Rio Para, a few

miles above Para. Its chief tributary is the Araguaya, which is nearly as large as the main stream. The length of the Tocantins is about 1,500 miles, and it is navigable in different parts of its course, but continuous navigation is prevented by falls and rapids. The tide ascends the stream for about 300 miles from the sea, and for some distance above where it unites with the lower branch of the Amazon it is eight miles wide.

TO'GA, the outer garment of the male citizen of ancient Rome. It was probably of Etruscan origin, and yet it came to be considered the distinctive badge of the Roman citizen. Authorities differ as to what were its shape and size, some of them holding that it was elliptical, while others say it was a segment of a circle. The toga of ordinary life was white in color. The *toga praetexta* had a broad purple border and was worn by children and by the curule magistrate and censors. When the young Roman was declared to be legally of age, he assumed the ordinary toga, on this account called the *toga virilis*. Persons in mourning and persons under impeachment wore the *toga pulla*, a garment of a dark color; while those who were seeking office were wont to dress themselves out in garments which had been made artificially bright by the help of chalk—hence their name of *candidati*. Under the emperors the toga as an article of common wear fell into disuse; but it continued to be worn by magistrates and in later figurative speech it was associated with law-making, so that even to-day one hears it said of a newly-elected Senator that he has "donned the toga."

TO'GO, HEIHA-CHIRO (1847-1917), a Japanese naval commander, born in Satsuma. Most of his education was received on board the *Worcester*, a British training vessel, and at the Royal Navy College, Greenwich, England. On



ADMIRAL TOGO

his return to Japan, he at once came to the front and was sent at first to Hawaii, to guard Japanese interests there. Togo was prominent in the Chinese-Japanese War and won the rank of vice-admiral. In 1900 he

was placed in command of the naval dockyards at Maizuru and did much to develop the Japanese navy. At the outbreak of the Russo-Japanese War, Togo commanded the main fleet and covered himself with laurels, gaining brilliant victories over the Russians in the harbor of Port Arthur and in the Battle of the Sea of Japan. In 1912 Count Togo was made admiral of the Japanese fleet.

TOGOLAND, *to'go land*, a territory in West Africa, north of the Gulf of Guinea, in area about 34,000 square miles. Though moist and unhealthy in climate, Togoland is very productive, and yams, corn, bananas, ginger, tobacco and cocoa are extensively cultivated. The principal exports are palm oil, rubber, ivory and copra. The population is almost entirely black, with a few white residents. The colony was made a German protectorate in 1884, but was taken by British and French forces after a three-weeks' campaign in 1914. It was agreed at the peace conference of 1919 that Great Britain and France should make a joint recommendation to the League of Nations as to its future government.

TOKYO, or **TOKIO**, *to ke'ō*, JAPAN, the capital and largest city of the empire, is situated in the east-central part of the island of Hondo, on the Bay of Tokyo and on both sides of the Sumida River, which divides it into two parts. The city has an area of thirty square miles and a population (1916) of 2,245,000, and is the sixth city of the world. In its newer streets, public utilities and buildings, Tokyo resembles a Western city. An excellent electric railway traverses the principal streets and an up-to-date water system furnishes an abundant supply of pure water taken from Lake Inokami, fifteen miles distant.

The imperial castle occupies the center of the city. The palace is a beautiful structure, in which are blended Japanese and European styles of architecture. The surrounding grounds form one of the most beautiful parks in Japan. Bordering the park are a number of government buildings of modern style of architecture. East of the palace is the business section, occupied by stores, warehouses, banks, newspaper offices and other commercial buildings. The principal business street extends through this section. Along the bay and both sides of the river are lowlands, through which extend many canals spanned by numerous bridges. The arsenal is sit-

uated in the northern part of the city and adjoins a garden noted for its rare beauty, and north of this is the imperial university, which is at the head of the Japanese system of education. Another structure of interest is the



TOKYO AND VICINITY

imperial museum, which contains many objects illustrating oriental art and history. The shrines which in the past were erected to former rulers are also among the most impressive and beautiful structures found within the city. These are usually adjoining one of the parks.

Tokyo has a well-organized fire department, a good police system, daily papers and such commercial arrangements as are found in the cities of Europe and America. Unfortunately the harbor is not deep enough to admit the largest ocean vessels, and this curtails its commerce to a considerable extent, but the manufactures are of importance and are increasing from year to year. The city is connected with Yokohama and other important towns of Hondo by railway.

The old name Yedo was given to a small village which was built at the head of the bay early in the fifteenth century. This became the site of a castle, and at the close of the sixteenth century the town was occupied by Ieyasu, who decided to make it the capital of the Empire. From that time its growth in size and influence was rapid, and it soon became the most important city in Japan. In

1868 the present name was adopted. The city has suffered from frequent fires, occasionally from earthquakes and from storms; nevertheless it has continued to increase in population and wealth. For other details, see TRAVELS IN DISTANT LANDS.

TOLEDO, OHIO, fourth in size among the cities of the state, is the county seat of Lucas County, at the mouth of the Maumee River, 130 miles north of Columbus and 244 miles east of Chicago, on the New York Central, the Cincinnati, Chicago & Saint Louis, the Wabash, the Michigan Central, the Ohio Central, the Pere Marquette, the Grand Trunk and a number of other railways, in all seventeen lines, embracing over twenty divisions, either entering or passing through the city. The town is built on low land which slopes gradually from the river. The park system includes twelve large, and over forty small, parks, all having an area of 1,025 acres. The large parks are joined by a boulevard system twenty-five miles long. On the east side are Collins Park and Navarre Park.

Among the important buildings are the courthouse, located in an ample square, which contains a statue of President McKinley; a Masonic Temple; the public library, with a collection of over 70,000 volumes; the Newsboys' Building, a large number of fine business blocks, Saint Paul's and Saint Patrick's churches and Saint Francis de Sales School and Chapel. Among the educational institutions are Toledo Medical College, Snead School for Girls, Saint John's College and a number of denominational and private schools. The public school system includes a manual training school and a state normal school. An organization known as the Museum of Art maintains a gallery of paintings.

Toledo is an important industrial center, ranking next to Cleveland in importance in the state, with over 4,000 manufacturing establishments. Its leading industrial plants include blast furnaces, large plate glass works, the largest wagon factory in the world, the second largest automobile works in the United States, malleable iron works, flour mills, scale factories and establishments for the manufacture of cut glass, brushes, staves and the preparation of spices. The city has an extensive trade, especially in coal, in the shipment of which it takes rank among Great Lake ports. Its harbor contains twenty-five miles of docks.

The city is built upon ground formerly occupied by the Miami Indians. It was first settled in 1832, and was chartered as a city five years later. With the settlement of the states in the Mississippi valley, the town began a steady and prosperous growth. Population, 1910, 168,497; in 1917, 202,010 (Federal estimate).

TOLL, *tole*, a tax paid, or duty imposed, for some privilege. Formerly it was the custom in the United States and Canada for travelers over country roads to pay tolls. Gates were placed across the road at regular intervals, and each person was required to pay a toll before the gate was opened and he was permitted to pass. The charge varied, a man driving a team paying more than the horseback rider. The revenue from the tolls was used to pay for road repairs. Tolls were also charged on bridges. Toll gates are still found in certain rural districts of Europe. On some of the canals of international importance, such as the Suez and the Panama, ships are required to pay moderate tolls. The tax is used to defray the cost of maintenance and pay interest on the money borrowed for the building.

TOLSTOI, *tahl'stoi*, LYOFF NIKOLAYEVITCH, Count (1828-1910), the foremost of Russian novelists and one of the most profound thinkers of his age, who felt as have few other men the burden of human woe. He was born at Yasnaya Polyana, of a wealthy and noble family. After his graduation from the University of Kazan, where he pursued one branch of study after another in a vain effort to find his calling, he joined the army and saw fighting on the western border. In the course of this pe-



LYOFF TOLSTOI

riod he wrote *Childhood*, his first published story, and *Boyhood*, both of which show the author's developing doctrine of nature as the guide of life. Reminiscences of his part in the Crimean campaign were published as *Tales of Sebastopol*—stories in which are pictured with dreary realism the horrors of war, the mockery of military glory.

Of the many social evils in the Russia of his day which cried loudly for reform, there was

none to which Tolstoi gave more sympathetic heed than the oppression of the serfs. He visited England, France and Germany to observe the condition of the laborers in those countries, and on his return to Russia in 1861 freed all his slaves and opened a school for the peasant children on his estate, teaching them himself until the institution was closed by the government. His sorrow over the tyranny and injustice he saw everywhere about him found vent at this time in two of his bitterest stories, *Three Deaths* and *The Cossacks*. A still more powerful arraignment of society was *War and Peace*, published in 1869. This extraordinary prose epic, showing the contrast between the artificial life of the upper classes and the wretched lot of the common people, stands as one of the supreme achievements of nineteenth-century literature. *Anna Karenina*, a novel dealing with the problem of personal liberty and interdependence, is scarcely less remarkable.

From this time philosophical and social problems occupied Tolstoi almost exclusively. *The Death of Ivan Ilyitch* and *The Power of Darkness* express forcibly his growing concern for the welfare of his fellow men and his sympathy with their sufferings. Gradually he dispensed with the comforts to which his inheritance entitled him and began living the simple life of the peasants, working all day in the fields or at the cobbling bench. No man ever exemplified more nobly the dignity of manual labor, the emptiness of worldly ideals, the worthlessness of property as a personal asset. But for his family he would have given everything he had to the poor. In the few leisure hours of his later years he wrote *The Kreutzer Sonata*, *The Resurrection* and *Master and Man*. Unsatisfied from the first with the doctrines in which he had been brought up, and seeking always for religious truth, Tolstoi arrived at a form of faith of which he made open declaration in *My Confession* and *My Religion*. Because of his radical views he was excommunicated by the Greek Catholic Church in 1901. Towards close of his life Tolstoi addressed to the czar letters advocating representative assemblies of the people, universal suffrage and other reforms. Among his writings is a remarkable prophecy which foretold with startling accuracy the outbreak and extent of the World War.

TOM'AHAWK, a war club or hatchet used by the North American Indians. The first

tomahawks were made by fastening a rock or deer horn to a wooden handle by means of hide thongs. From the early white settlers the red man learned to make hatchets on the European model, with metal heads. Tomahawks were used either in close combat or were thrown so as to strike with the edge. The early colonial writers made it a symbol of war, and from this fact arose the expression *bury the hatchet*.

TOMATO, a plant belonging to the nightshade family, same family as the potato and the egg plant. It is a native to the Andes region of South America and has been introduced into most warm or temperate countries. It is cultivated for its fruit, which is fleshy, usually scarlet or orange in color and irregular in shape. Tomatoes are eaten raw, are used as ingredients in salads, or are stewed and cooked in various other ways.

For a long time after it was brought from Peru, the tomato was known as the *love apple*, and was considered poisonous; in fact, it was not until the early part of the nineteenth century that its value as an article of food was realized. The yearly crop in the United States is very large, and the annual output of the canned stock is larger than that of any other fruit. New Jersey ranks first in the production of this crop, with Maryland, Florida, New York and Texas as close rivals.

TOMB, a burial vault, either below or above ground. Among the most civilized of ancient peoples the tomb had an important place. The royal tombs known as the Pyramids (which see) and the many-chambered rock-hewn tombs that sprinkle the Nile valley are among the most important monuments that have come down from the early Egyptians. The Jews buried their dead in sepulchers hewn out of solid rock, and it was in one of these, belonging to Joseph of Arimathea, that Christ was laid. The Greeks, too, used this kind of tomb and also built burial vaults above ground, the colonists of Asia Minor erecting the most elaborate, notably the tomb of Mausoleus, in Caria, from which the word *mausoleum* is derived. In general, the Romans paid more attention to places for the repose of their dead than did the Greeks. The chief road entering Rome, the Appian Way, was lined with tombs; the most notable of these was the Emperor Hadrian's. Elsewhere in Italy tombs were built in the city streets. At one time there it was customary

to build underground chambers with wall niches to receive the bodies of families or communities. The catacombs, the underground crypts in which the early Christians interred their dead, may be regarded as a form of tomb.

In medieval times it became customary among Christians to bury their dead in churches, the stone coffin or sarcophagus being used for this purpose. Beautiful tombs are not numerous in the Orient, and yet the most exquisite building in Asia, perhaps in the world, is the Taj Mahal, the sepulchre of the Shah Jehan and his favorite wife, at Agra, India. At the present time it is not customary to erect elaborate tombs, either to members of one's family or to great men. A conspicuous exception in the United States was the building, in New York City, of a magnificent tomb to the memory of Ulysses S. Grant.

TOMBIG'BEE, a river which rises in the northeastern part of Mississippi, flows south, then southeast into Alabama and continues in this direction until it unites with the Alabama to form the Mobile River. The length is 450 miles, and it is navigable for steamboats to Aberdeen, Miss. The chief tributary is the Black Warrior.

TOMP KINS, DANIEL D. (1774-1825), an American statesman, Vice-President of the United States, born at Scarsdale, N. Y. He was educated at Columbia College, studied law, was admitted to the bar in 1797, and in 1804 was appointed a judge of the state supreme court. Three years later he was elected governor and served ten years. He was bitterly opposed to the chartering of the Bank of America in New York, in a long contest in which corruption played an important part against him, and he took the unparalleled step of proroguing the legislature to prevent it, but without success. He persistently advocated the abolition of slavery, which was accomplished in New York, largely through his efforts, in 1827. From 1817 to 1825 he was Vice-President of the United States.

TOM'TIT. See TITMOUSE.

TON, *tun*, a measure of weight in the English system, equivalent to twenty hundredweight. A standard hundredweight in both England and America is equal to 112 pounds; hence the standard ton in large commercial transactions is equal to 2,240 pounds. In America, however, the so-called *short* ton, of

2,000 pounds, is commonly used, the hundredweight being reckoned at 100 pounds, although Congress has legislated that unless otherwise specified a ton weight is to be 2,240 pounds avoirdupois. Coal is bought by dealers by the *long* ton of 2,240 pounds and is sold to the consumer by the short ton.

STONE, in music, the sound produced by the vibration of a musical instrument or by the human voice (see SOUND; MUSIC). Nearly every musical sound is composite; that is, consists of several simultaneous tones, with different rates of vibration, according to fixed laws, which depend on the nature of the vibrating body and the mode of producing its vibrations. These several tones are called *partial tones*. The one having the lowest rate of vibration and the loudest sound is termed the *prime, principal, or fundamental, tone*; the other partial tones are called *harmonics, or overtones*. See HARMONICS.

TONGA ISLANDS, or **FRIENDLY ISLANDS**, a cluster of Polynesian islands in the South Pacific Ocean. The archipelago, comprising 150 islands, consists of three groups, which are divided from one another by two narrow channels. Of the islands, only Tongatabu, the largest, Vavau, and Eua are of any importance. The main islands are covered with rich vegetation, and the soil is very fertile. Copra and fungus are exported, and the making of tapa and mats constitutes the chief industry.

The main group of islands was discovered in 1643, by Tasman, and since 1900 a protectorate has been proclaimed over them by Great Britain, although they are ruled by a native king who resides at Nukualofa, in Tongatabu, which is the capital of the kingdom. Population 1911, 23,900, of whom 308 were Europeans.

TONIC, in medicine, any remedy which improves the tone or vigor of the fibres of the stomach and bowels or of the muscular fibers generally. Tonics may be said to be of two kinds, medical and non-medical. *Medical tonics* act chiefly in two ways: (1) indirectly, by first influencing the stomach and increasing its digestive powers, this being the effect of such vegetable bitters as chamomile, cinchona bark, gentian and taraxacum; (2) directly, by passing into and exerting their influence through the blood, as is the case with various preparations of iron, certain mineral acids and salts. The *non-medical tonics* are open air, exercise, friction, cold, in

such forms as the shower bath and cold sponge bath.

TONGKING', or **TONQUIN'**, a French protectorate in French Indo-China, bordering on the Gulf of Tongking, an arm of the China Sea. The territory is drained by the Red River and has an area of 46,000 square miles. Its population exceeds 6,000,000, of whom 6,000 are Europeans. Its chief cities are Hanoi, the capital of French Indo-China, and Haiphong, the principal port. The leading product is rice, though corn, sugar cane, cotton, coffee, fruits and tobacco are also raised, and there is an important silk industry. Exports are rice, maize, animal products and raw silk. Roman Catholicism has an extensive hold on the people, who are mainly Anamese in race. Tongking was an independent state until 1882, when it came under the control of Annam. The French began military operations on the coast in 1873, facing opposition from both Annam and China until the territory was finally annexed to France in 1884.

TONGUE, *tung*, the muscular organ of the mouth; also, the principal organ of taste. The tongue is attached at its back extremity to the *hyoid* bone and its opposite end is free to move in all directions. The interior is composed entirely of muscles, whose fibers extend in nearly all directions and are so arranged as to be mutually helpful. By them the tongue can be flattened, made to assume nearly a cylindrical form, protruded from the mouth or directed to any part of the mouth in which food may lodge. Another set of muscles, the *extrinsic*, joins the tongue to opposite supports and causes it to move. The exterior is covered with a mucous membrane, or epithelium, in which are the papillae containing the end organs of the nerve of taste. The back part of the tongue contains a number of glands which secrete mucus, to keep it moist. Besides being the principal organ of taste and articulate speech, the tongue performs an important function in mastication and in swallowing. See **TASTE**.

TONNAGE, *tun'naje*, the number of tons' weight which constitutes a ship's carrying capacity with safety. This is known as *dead weight tonnage*. *Ordinary*, or *gross tonnage* is not strictly the measure of a ship's carrying weight, but a gauge of the vessel's dimensions, more or less accurate. The interior capacity of the hull of a ship and its deck houses are divided by 100, on the sup-

position that 100 cubic feet space will hold a ton. In freight ships, forty cubic feet of merchandise is considered a ton; however, when the weight exceeds 2,000 pounds, or 2,240 pounds, as the custom may be, payment is made by weight. Each of the great ship canals of the world has an individual tonnage measurement upon which the exaction of tolls is based. See **SHIP**.

TON'SILS, *THE*, two oblong, soft bodies, situated on the sides of the throat, and made up of minute glands, which give out a secretion that helps the food to pass them. During a cold or a sore throat, they are often enlarged, and when permanently enlarged they may be removed without danger. Physicians recommend this slight operation.

TONSILLITIS, *tahn si l'itis*, inflammation of the tonsils. Tonsillitis is rare in infancy or in old age, persons between the ages of ten and forty being most susceptible to it. The inflammation, though seldom fatal, is very painful. The tonsils sometimes become ulcerated, and large accumulations of pus are common. When this last condition occurs the disease is known as *quinsy*. The causes of the various forms of tonsillitis are not definitely known. The commonest causes are severe colds, which cause a slight inflammation of the tonsils and render them susceptible to other germs. Enlarged or inflamed tonsils should never be exposed to the contagious diseases. An attack of tonsillitis ordinarily lasts five or six days. The first symptom may be a slight chill; then comes a swelling and pain in the throat, with difficulty in swallowing and in breathing. Rest in bed, hot compresses on the neck, purgatives and an abundance of soft or liquid food are important points in the treatment. The most trustworthy medicines are iron and quinine. See **QUINSY**.

TONSURE, *tahn'shure*, a religious ceremony in the Roman Catholic or Oriental churches whereby an individual cuts or shaves his hair to denote his dedication to a clerical or monastic life. Clerical tonsure was mentioned in the fifth century, but the practice was not universally adopted until the Middle Ages, when various modes became prevalent. The *tonsure of Peter*, that of the Roman Church, consisted in shaving the crown as well as the back of the head, leaving a circular ring of hair around the head; the *tonsure of James* consisted in shaving the front part of the head from ear to ear.

TONTY, or **TONTI**, *tohN'tee*, HENRI DE (about 1650—about 1704), the trusted companion of the explorer La Salle. He was born in Italy, but early entered the army of France, and in July, 1678, accompanied La Salle to Quebec. He assisted in preparing for several of La Salle's great exploring expeditions, and was left by La Salle in March, 1680, in charge of Fort Crevecoeur, near Peoria, Ill. Tonty was forced to abandon the position because of mutiny and the hostility of Indians, and returned to Green Bay. Later he joined La Salle at Michilimackinac (Mackinac Island), accompanied him in his voyage down the Mississippi, and was placed in command of Fort Saint Louis, at Starved Rock, near the present village of Utica, Ill. He continued to live among the Illinois Indians until 1702, exerting a beneficial and strong influence over them.

TOOMBS, *toomz*, ROBERT (1810—1885), an American statesman, lawyer and soldier, born at Washington, Ga. He began the practice of law in 1830. In 1827 he was elected to the state legislature, where, except during 1841, he served until 1845. He then became a member of the House of Representatives for four terms. In 1853 he was elected to the Senate. He opposed the Mexican War and the consequent acquisition of territory by conquest; but largely through his influence, in 1861, Georgia passed its ordinance of secession, and he then withdrew from the Senate. He was a delegate to the Confederate congress at Montgomery and subsequently was Secretary of State in the Confederacy. He resigned this office soon after, to take a commission, and as brigadier-general distinguished himself at Antietam and in the second Battle of Bull Run. At the close of the war he resumed law practice in his native town.



ROBERT TOOMBS

TOP, one of the most popular of children's toys, interesting because it can be made to spin upright on its axis with a velocity and in a manner depending on the skill with which it is handled. In its simplest form it is a solid cone-shaped piece of wood with a metal peg

at the pointed end and a knob or handle at the opposite end. The spinning is accomplished by means of a cord, which is wound from the peg and upward. A wooden button on the free end of the cord is held between the fingers; the top is tossed to the ground and the string jerked back, starting the top to spinning as it rapidly unwinds.

The toy factories have produced many beautiful and interesting playthings which are modifications of this form. One of these is a large, hollow tin top, with projecting axis at the top, around which the cord is to be wound. Another similar to this has holes in the side, through which the air passes and causes a singing note as the top spins. Still another is decorated with colored designs, which in motion result in strange optical illusions. Some of the mechanical tops can be wound up to run an hour; others are music boxes which play tunes.

TO'PAZ, a mineral, ranked among the gems. It varies from transparent to translucent, has a clear luster and may be yellow, white, green or blue in color. It is harder than quartz and is nearly four times as heavy as water. Chemically, it is a silicate of aluminum, in which the oxygen is partly replaced by fluorine. It occurs in masses and is crystallized in prisms. Crystalline topazes are found generally in igneous and metamorphic rocks and in many parts of the world. Various localities in Maine, Colorado and Utah supply them, and they are common in parts of India and in Brazil. The Brazilian topazes have deep yellow tints; the Siberian topazes and those found in the Scotch Highlands are bluish. In ancient times the topaz was a symbol of friendship and was thought to drive away sadness and bestow courage. It is the birthstone for November.

TOPEKA, *toh pe'kah*, KAN., the capital of the state and the county seat of Shawnee County, sixty-six miles west of Kansas City on the Kansas River and on the Atchison, Topeka and Santa Fé, the Chicago, Rock Island and Pacific, the Missouri Pacific and the Union Pacific railroads. The city is situated on rolling prairie land, at an elevation of about 900 feet, and covers an area of seven square miles. It is laid out with broad, well-shaded streets, and has several attractive parks.

The most notable buildings near the center of the city are the state capitol, the Kansas Memorial building, and the Federal build-

ing. Other important structures are the court house, the city hall, the Y. M. C. A., the Y. W. C. A., the Mills building. The state hospital for the insane occupies five large buildings on extensive grounds west of the city, and the state industrial school for boys has accommodations for two hundred boys on a farm of 210 acres north of the city. Topeka is the seat of Washburn College (Congregational), of the College of the Sisters of Bethany (Episcopal), of the Kansas Medical College, and of several business colleges. The libraries of the city are the free public library in a beautiful building on the state grounds, a large state library and that of the state historical society, the latter two in the state capitol.

Industrial establishments include the railroad shops of the Atchison, Topeka & Santa Fé Railroad, extensive exporting flour mills, foundries, brickyards, machine shops, packing houses, creameries, starch works and manufactories of furniture and clothing. Three fine hospitals, besides that of the Santa Fé railway, are located here. The place was settled as one of the free state towns in 1854, and became notable for its feuds between the anti-slavery and pro-slavery elements. It was chartered as a city in 1857, and was selected as the state capital in 1861. It adopted the commission form of government in 1909. Population, 1910, 43,684; in 1917, 49,538 (Federal estimate).

TORNA'DO, a revolving storm that has great force. The term was originally applied to the hurricanes prevalent in the West Indies and on the west coast of Africa and in the Indian Ocean, but more recently it has been extended to apply to other storms. In the United States the tornado is frequently, though incorrectly, termed a cyclone.

Characteristics. Tornadoes, usually form within thunder storms and are caused by conditions similar to those which produce whirlwinds (see WHIRLWIND). They occur on warm days, when there is great humidity.

The tornado cloud has a funnel-shaped vortex, in which the velocity of the whirling motion increases as it approaches the center, where it becomes so great as to destroy all objects within the path of the tornado. The direction of the whirl is contrary to that of the hands of a watch, and the tornado moves from southwest to northeast, with a velocity varying from twenty-five to forty miles an hour. The danger lies in the path of the

funnel-shaped cloud which is usually but a few rods in diameter. Near the vortex the velocity of the wind is such as to overthrow and often destroy small structures and to draw light objects within the vortex.

Many theories have been advanced to account for these destructive storms, but none seems perfectly satisfactory. The conditions favorable to the development of a tornado are a warm layer of excessively humid air next to the earth, and a layer of cool air above. When an upward current is once started in the warm air, a rotary motion is immediately produced by the inrush of cold air from above. This rapid rotation causes a small area of very low pressure, and the force of the upward current soon increases to a degree that enables it to bear aloft all objects with which it comes in contact. In the center of the vortex the pressure is so light that buildings within the path of the tornado are often wrecked by the expansion of the air within.

The condensation begins in the upper air, where the temperature is lowest, and as the whirling column continues to cool by expansion of the rising air, the point at which the condensation takes place gradually approaches the earth, and the cloud continues to form lower and lower, until it comes in contact with the ground. The extension of the column downward is not due to the lowering of the cloud, as frequently supposed, but to the descent towards the ground of the point of condensation.

While no portion of the United States east of the Great Plains seems free from these storms, they are most frequent in the Mississippi Basin, occurring in the south in the early spring and gradually traveling northward, until in midsummer they occur as far north as Minnesota and North Dakota. See CYCLONE; HURRICANE; TYPHOON.

TORONTO, *toh rahn'toh*, ONT., the capital and largest city of the province, and the second largest in Canada, ranking next to Montreal. It is situated on the northwest shore of Lake Ontario, 334 miles southwest of Montreal and forty-one miles north of the mouth of the Niagara River. Three main railways enter the city—the Grand Trunk, the Canadian Pacific and the Canadian Northern—and it is visited by many of the steamers plying the Great Lakes.

General Description. The city has a charming location on ground rising gradually until it reaches an altitude of 200 feet in

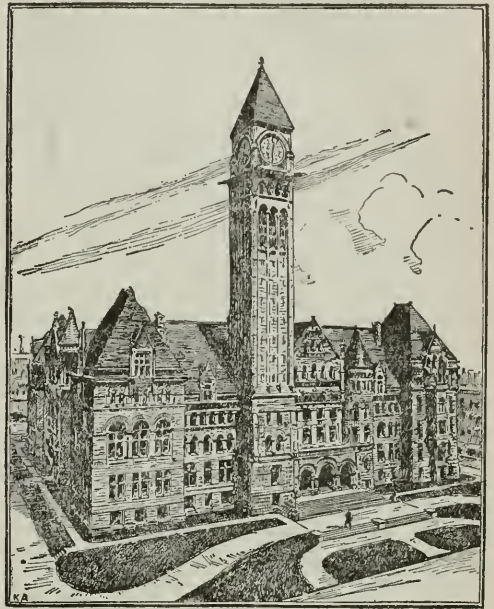
the highest part. On the hills are beautiful homes, fronting broad streets lined with fine shade trees. The spacious harbor is protected by a low, sandy island that extends for about three miles. In the summer time the harbor is dotted with canoes, launches and sailboats. The whole harbor front is being improved in accordance with plans involving the expenditure of millions of dollars. A thousand acres of waste land is being reclaimed, and the site is to be used for commercial and industrial purposes. A five-million-dollar Union Station was in process of construction in 1919; other improvements include the building of sea walls and docks and the making of a boulevard and park system along the lake front.

Parks and Buildings. Among the many beautiful parked areas of Toronto the largest are High Park (335 acres), Exhibition Park (235), Humboldt Boulevard (129) and Riverdale Park (108), the latter possessing a fine zoological garden. In Exhibition Park are held annual exhibits showing progress along agricultural, industrial and art lines. The buildings housing these exhibits are permanent, fireproof structures. Toronto residents patronize two pleasure parks—Hanlon's Point, on the harbor island, and Scarborough Beach.

The city hall, shown in the accompanying illustration, is the most pretentious of the public buildings. In its tower is the largest winding clock on the continent. The edifice was eight years in building, and cost about \$2,500,000. The cornerstone was laid in 1891. In Queen's Park, which is situated about a mile from the water front, is the imposing building of the provincial parliament. Other notable structures include the Royal Bank, the Bank of Toronto, the General Hospital, the Arena Auditorium, the buildings of the Canadian Pacific Railway and the public library. Toronto has a large number of fine churches, among which are Saint James Cathedral, with a spire 316 feet high, the Metropolitan Methodist Church, the Cathedral of Saint Michael, Saint Andrew's, the Jarvis Street Baptist and the Bond Street Congregational churches.

Education. The city is the foremost educational center of Canada. The University of Toronto, housed in a group of artistic buildings in Queen's Park, is the largest institution of higher learning in the Dominion. Other notable schools are McMaster

University (Baptist), Trinity College (Anglican), Upper Canada College, Saint Andrew's College, and the technical school, one of the best equipped schools of its kind in the world.



TORONTO CITY HALL

Art and musical schools of high standard are also maintained, and the city supports two musical enterprises of considerable fame, the Mendelssohn Choir and the symphony Orchestra. The splendid public school system is managed by a board of education elected by popular vote.

Industry and Commerce. About one-eighth of all the articles manufactured in the Dominion are produced in Toronto, whose industrial establishments have an output whose combined value is about \$250,000,000 a year. The city is the leading Canadian center for slaughtering and meat packing, and it produces large quantities of lumber, musical instruments, clothing, wall paper, machinery and iron and steel goods. Among Canadian cities Montreal alone has a larger volume of banking business; Toronto is first in the exchange of livestock, grain and fruits, and as a wholesale jobbing center. In the city is the largest department store in the British Empire.

History. The city was founded in 1794, under the name of York, but was destroyed by the Americans in 1813. In 1834 it was incorporated under the present name. It suf-

fered from the rebellion led by William Lyon Mackenzie in 1837 and from a fire in 1849. Since that time it has been remarkably prosperous. Population, 1911, 376,538; in 1918, 489,681 (local estimate).

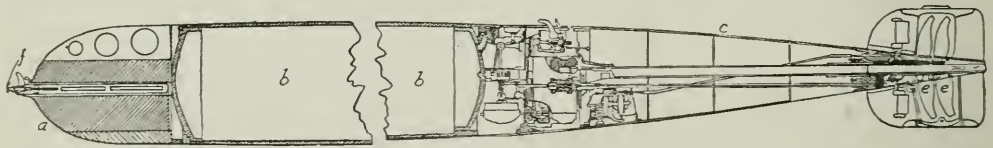
TORONTO, UNIVERSITY OF, an institution at the head of the school system of Ontario, chartered in 1807, under the name of the University of King's College. The further organization, however, was delayed, and the university was not opened until 1843. Six years later, the name was changed to the University of Toronto. The institution has undergone several reorganizations. It now includes faculties of arts, law, medicine and applied science and engineering, and it has instituted courses and examinations for degrees in agriculture, dentistry, music, pedagogy, pharmacy and household science. There are also a number of colleges and schools throughout the province affiliated with the university, and extension work is maintained by a special committee. Women are admitted. The management of the university is similar to that of the English universities. There is a student body of about 4,000, and a faculty of 400. The library contains 150,000 bound volumes and there are also about 50,000 pamphlets.

TORPEDO, a death-dealing device which is propelled through water with a great ship as its target and intended victim. During the great war of 1914-1918, the torpedo became one of the most terrifying weapons used upon the seas. The modern or Whitehead torpedo is one of the most ingeniously devised instruments ever invented for the purpose of destroying ships and human life. It consists of a cigar-shaped steel shell from eighteen to twenty inches in diameter and

of 2,500 pounds to the square inch; and the after body, *c*, which contains the machinery for propelling the torpedo. The propellers, *e, e*, resemble those used on small motor boats. They are operated by the compressed air. The engine may be of the crank and piston type, or it may be on the plan of the steam turbine. A gyroscope (which see) holds the torpedo to its course, but there is now an invention of John Hayes Hammond, Jr., which makes it possible to direct the course of a torpedo by electricity, from the shore or from a vessel. Successful experiments have been made.

Projecting from the head is the war nose, which discharges the explosive when it strikes the ship. The charge usually consists of about 250 pounds of moist guncotton or an equivalent quantity of T. N. T. This charge has an explosive force of sufficient strength to shatter the bottom or the side of the strongest warship. A complete torpedo of the largest size costs fully \$8,000. Torpedoes used in target practice contain no explosive, and are recovered and used over and over again. A torpedo of the most powerful type can travel about six miles at a speed of about thirty miles an hour before its power is exhausted. If it is adjusted for a shorter distance its speed may be increased to forty miles an hour. Submarines seldom fire at a ship more than a mile distant, and then the chances are that the torpedo will miss its mark. When the ship is within 700 to 1,000 yards there is a fair chance of scoring a hit. The torpedo may be fired from above or beneath the surface of the water, but, since the perfection of the submarine firing from above the water has practically been abandoned.

History. The first torpedo that can be considered a forerunner of the present type was



TORPEDO

(a) Head; (b) air cylinder; (c) after body; (e) propellers; (f) war nose.

from seventeen to twenty-two feet long. It has a conical-shaped head, and towards the rear it tapers to a narrow cylindrical tail to which the propellers are attached.

The entire shell is divided into three chambers—the head, *a*, which contains the charge of explosive; the air cylinder, *b*, which contains compressed air, often under pressure

invented by David Bushnell, an American. To become effective, Bushnell's torpedo had to be attached to the ship, and this called for a sort of submarine boat, just large enough for one man, who descended and attached the torpedo to the bottom of the ship and then got as far away as possible before it exploded. Bushnell's torpedo was not found practical.

In 1585 an Italian destroyed a bridge on the Scheldt, by sending a boat charged with gunpowder down the river. The charge was fired by means of clockwork. A century and a half later, a Frenchman exploded some rockets under water and destroyed some small boats. While numerous experiments were made in the next hundred years, the torpedo was not brought to practical use until the American Civil War, when it became a very powerful and dangerous weapon.

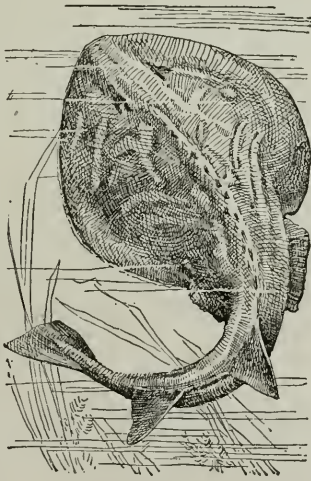
The first torpedoes intended to be projected through the water were shot from a gun like a shell. If the target was more than a quarter of a mile distant it could not be reached. This torpedo required a light, swift boat that could approach close to its target, fire its shot, and get away quickly. It was this requirement that brought the torpedo boat of the last quarter of the nineteenth century into existence. From this torpedo that of the Whitehead type was developed and brought to a high degree of perfection during the World War.

Related Articles. Consult the following titles for additional information:

Guncotton
Gyroscope

Submarine
Torpedo Boat

TORPEDO, or **ELECTRIC RAY**, a large, flat fish of the ray family, which inhabits the warm waters of all seas. It is remarkable chiefly for a set of organs in the head in which electricity is generated. The broad, flat body ends in a comparatively slender tail. The power of the electrical discharge varies with the health and size of the fish. The shock of a full-grown



TORPEDO

t o r p e d o (which may weigh from 50 to 250 pounds) is sufficient to disable a man; that of the smaller specimens is used effectively in capturing prey. After a shock the electricity

is exhausted, and time and food are needed to supply a fresh storage.

TORPEDO BOAT, a comparatively small boat equipped for shooting torpedoes. The object of the torpedo boat is to approach other ships stealthily, and to project the torpedoes in the direction of the enemy, then steal swiftly away. The development of the submarine (which see), and the consequent change of methods in shooting torpedoes, has rendered the torpedo boat of less value than it formerly possessed.

Torpedo Boat Destroyer. The havoc wrought by torpedoes fired from torpedo boats led to the construction of a boat especially adapted for warfare against the latter. Torpedo boat destroyers were merely torpedo boats of large size and high speed, fitted to withstand any weather and to meet torpedo boats at an advantage. The armor was heavy and the offensive armament was strong. The destroyers were equipped like torpedo boats, and so at times they took the place of the latter; in fact, a combination of the two was not an uncommon thing in navies. In the World War submarines supplanted the old-type torpedo boats and destroyers, and allied fleets of swift vessels armed with guns and depth charges were employed successfully in clearing the seas of the deadly underseas craft.

TORQUEMADA, *tor ka mak'da*, THOMAS DE (1420-1498), a Spanish inquisitor-general, born at Valladolid. He was head of the Inquisition for fifteen years, and in the course of that time sentenced to death more than 10,000 anti-Catholics and expelled the Jews and Moors from Spain. He believed that the stability of Spain depended on religious unity, and he suppressed heresy as a patriotic and religious duty. His cruelties made him intensely unpopular with the people and were so severe the Pope found it necessary to interfere.

TORRENS SYSTEM, a system of registering titles to real estate, introduced into Australia by Sir Robert R. Torrens in 1857. The purpose of the system is, first, to make the transfer of real estate as simple and safe as the transfer of personal property; second, to do away with the old cumbersome system which requires an examination of the title every time a transfer of the property is made.

How to Get the First Torrens Title. The owner of land desiring a Torrens title should

file with the registrar a petition for registration. With the petition he must file all records in his possession pertaining to the title, and also give in writing, under oath, a statement of all incumbrances (debts) on the property. If other persons are interested in the property by marriage or otherwise the registrar notifies them of the petition and gives them opportunity to be heard. The petition, all records pertaining to the title and any objections raised are placed in the hands of the examiner of titles. If he finds the facts to be as stated by the petitioner, he files the old papers and issues a certificate of ownership. The certificate is issued in duplicate, the original being kept in the office of the registrar, and the duplicate given to the owner.

How to Transfer a Title. When real property is sold under the Torrens system, the first certificate is cancelled and a new one issued, and this completes the transaction. No examination of title is necessary, for the first certificate is *indefeasible*, that is, it cannot be set aside. Should any claims arise against the property they cannot affect the title, nor will the original owner have to pay them. They are paid by the state from a fund created for that purpose, by charging a slight tax on the property registered. This tax seldom exceeds one-tenth of one per cent, and it has been found ample for meeting all claims.

Extent of Use. The Torrens system was introduced into South Australia in 1857, and was soon adopted by the other Australian states and by New Zealand. It has been adopted in England and a number of countries on the continent of Europe. It is in general use in the northwest provinces of Canada, and to a limited extent in the maritime provinces. Illinois was the first state of the United States to adopt the system. In 1919 it was in use in ten other states, and in Hawaii and the Philippine Islands.

TORRICELLI, *tor re chel' le*, EVANGELISTA (1608-1647), an Italian mathematician and physicist. Torricelli's name is important in the history of science as the discoverer of the law on which the barometer depends. The principle of this law is that the pressure of the atmosphere sustains a column of mercury of equal area and of the same weight as the column of atmosphere. See BAROMETER.

TORRINGTON, CONN., in Litchfield County, twenty-six miles west of Hartford,

on the Naugatuck River and on the New York, New Haven & Hartford Railroad. It is an industrial center, producing bicycles, ice skates and roller skates, woolens, brass articles, novelties, needles, hardware and tobacco goods. The municipality has a public library, a fine city hall and a Y. M. C. A. The place was settled early in the eighteenth century and was chartered as a borough in 1887. John Brown was born here in 1800. Population, 1910, 15,483; in 1917, 20,041 (Federal estimate). Torrington has had the largest percentage of increase in population of any city in Connecticut since 1910.

TORSION, *tor'shun*, **BAL'ANCE**, an instrument employed to measure the intensities of very small forces. Its essential parts are a fine horizontal bar suspended by a thread of silk or other substance and a graduated scale to which the thread is attached. The rotation of the bar determines and registers (with the aid of a mirror beneath) the intensity of the force acting on it. The name of the instrument has reference to the torsion (twisting) of the thread with the movement of the horizontal bar acted on by the force to be measured. See GALVANOMETER.

TORT, a civil wrong for which the law requires compensation in damages. The right to damages for a tort arises not necessarily from breach of contract, as a tort may be committed where no contract has existed. Thus nuisance, libel and slander, trespass and injuries to property are torts. The same act may be both a tort and a crime. Thus a man may be prosecuted by the state for assault and battery and at the same time may have brought against him by the injured man an action for damages.

TORTOISE, *tor'tis*, or *tor'tus*, a member of a group of reptiles belonging to the same family as the turtles, but living on land either partially or exclusively. Unlike the turtles tortoises have highly-arched shells, or carapaces, and the hind feet are club-shaped. Of the three well-defined species in the United States the most important is the *gopher* tortoise, found in the Southern states. It averages about nine pounds in weight, and the carapace is about eleven by eight inches. In the islands of the Southern Pacific giant tortoises were once numerous, but they are now nearly extinct. A few specimens are preserved in zoological gardens. Some have been known to live more than 150 years. See TURTLE.

TORTOISE SHELL, a name popularly applied to the horny plates of certain turtles. The designation is not accurate, as the tortoise is a land turtle, whereas tortoise shell is a product of the hawksbill turtle, which inhabits tropical seas. The carapace of this animal is composed of layer upon layer of horny plates. To detach these it is necessary to immerse the shell in boiling water. The layers are very thin when removed, and for commercial purposes must be welded together. The welding is done by boiling the scales in water and then subjecting them to heavy pressure. After this the slabs of shell can be shaped into combs, eye-glass rims, card cases and the numerous toilet articles for which tortoise shell is in demand. The material has been used at various times for inlay work.

TORTURE, the infliction of severe bodily pain, for punishment, for revenge or to force a confession from the individual so mistreated. It was customary for primitive people, including the American Indians, to inflict cruelties upon their captives. In the Middle Ages throughout Europe torture was commonly resorted to, especially by the Church to enforce religious conformity and to extort evidence in heresy trials; John Huss and Savonarola were victims of such proceedings.

Although the cruelties of the custom were recognized and its application deplored, the practice continued in many parts of Europe until the early part of the nineteenth century; even up to 1917, the year of the revolution in Russia, exiles to Siberia were flogged unmercifully. The devices and methods of torture were as varied as they were unspeakably cruel. See ORDEAL.

TORY, *toh'ri*, a political party name, used in England and other Anglo-Saxon countries, is of Irish origin, having first been applied to the Irish loyalists who fought for King Charles I. At one time any sort of an Irish outlaw was called a Tory. The term was first used in English politics in 1679, being applied in derision to the Roman Catholic opponents of the bill excluding the Duke of York (James II) from the throne. Thus it came to be identified with the court party, their opponents being classified as *Whigs*. Although *Tory* was in the beginning almost synonymous with Catholicism, it lost all sectarian implication when the British Crown became Protestant, but continued to

be identified with the royal party. In America in Revolutionary times the term was applied to all adherents of England. With the decline of Toryism in England the adherents of the doctrines gradually merged with the Conservatives, but the name is still in use.

TO'TEM, among some primitive peoples an object regained as a symbol of a tribe, family, or individual. It is usually a representation of an animal. Those who have the



TOTEM POLES

same totem are regarded as bound by closer ties than any other persons. The North American Indians commonly carve their totems on poles. The Indians of Western Canada often carve theirs on the trunks of cedar trees.

TOUCAN, *too'kan*, a bird found only in



TOUCAN

tropical or semi-tropical America, remarkable for the size of its bill, which at the base is

nate the date and place of payment and return the draft to A. B. Smith & Co., who may hold it until it becomes due or discount it at the bank.

Trade acceptance is a comparatively new method of merchandising in America, having originated in 1917, but it has been in use in other countries for a long time. It is indorsed by the Chamber of Commerce of the United States, the American Bankers Association and the National Association of Credit Men. It is claimed for it that it makes for better business, creates a better class of accounts, insures more prompt attention to payments when they become due, and extends the use of negotiable paper.

TRADE-MARK, an emblem or device, used by manufacturers to distinguish their productions. Such marks have been in existence for centuries, but it is only in recent years that they have been legalized. They may now be registered and protected in all the more important countries and even by citizens of one country in another. According to the trade-mark statutes of the United States a mere descriptive title or a geographical name does not constitute a proper trade-mark; it should be some invented word or words, distinctive device, figure, emblem or design, or a written signature. Any mark or name calculated to mislead as to the real name or origin of the goods is invalid. Trade-marks are registered at the Patent Office, at a fee of \$25, the right running for thirty years.

TRADE UNIONS. See LABOR ORGANIZATIONS.

TRADE WINDS, perpetual or constant winds which occur in all open seas on both sides of the equator, for a distance of about 30° north and south of it. North of the equator their direction is from the northeast, with occasional slight variations; south of the equator they proceed from the southeast. Their importance to ocean commerce before the days of steam navigation gave them the name of *trade winds*.

These winds result from the differences in temperature between the equatorial and polar regions. The heat of the torrid zone causes the air there to become lighter and consequently to rise. As it rises the cooler surface air north and south of it rushes in to take its place. This movement of air is constantly going on. The oblique direction of these winds is accounted

for by the fact of the earth's rotation. The belt between the two systems of trade winds is a region of calm, which, in the days of sailing vessels, was dreaded by mariners. This belt shifts somewhat with the seasons.

Over the land areas these winds are displaced by air currents caused by various local conditions, and they are not often to be identified except in certain localities or at certain seasons. In some regions, however, they have marked effect upon climate. Laden with moisture, they cross South America and on reaching the Andes are forced upward to levels where their moisture is condensed into rain. In crossing Africa they precipitate their moisture in the eastern highlands, and by the time they reach the region of the Sahara Desert they are dry. See WIND.

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TOWER OF LONDON, an ancient fortress and prison in London, consisting of a collection of buildings of various ages, now used as an armory. It is situated on a somewhat elevated position on the north bank of the Thames, outside the old city walls. It covers about thirteen acres and is surrounded by a battlemented wall, flanked with massive towers and encircled by a moat. There is also an inner wall, broken by towers and interspersed with buildings. In the center is the White Tower, the keep of the old fortress; around it are the chapel, the jewel house, the barracks and other buildings.

The Tower was a medieval fortress and served at once as a palace, a prison and a place of defense. The White Tower was built by William the Conqueror in 1078 and was successively strengthened by various English sovereigns. The regalia, consisting of the royal crowns and scepters, are now kept and exhibited in the jewel house. The armory contains a fine collection of armor and weapons. In the part called the Bloody Tower, the two young princes, sons of Edward IV, were murdered by order of their uncle, Richard III. The Tower is now chiefly used as an arsenal, and has a small military garrison of the yeomen of the guard.

In the World War the British government imprisoned captured spies in the Tower, and there many of them were executed.

TOWERS OF SILENCE, massive circular stone, brick, or cement structures erected by the fire worshippers of Persia and the Parsees of India. These towers, about twenty to thirty feet in height and much greater in diameter, were the structures upon which the Parsees exposed the bodies of their dead, according to the religious teachings of their leader, Zoroaster, to be devoured by vultures or other animals. The best modern specimens are found in and near Bombay, India. The British government has nearly stopped the practice.

TOWN MEETING, an annual assemblage of the voters of a New England township, at which selectmen, school officials and other officers are elected, laws are enacted and taxes are voted for the coming year. It is a typical New England institution, a survival of colonial days, and is often cited as the most purely democratic system of government known, being that of action by all the people for themselves and not government through elected representatives.

TOWNSHIP, the smallest political administrative unit in a state, except the school district (which see). A township is one of the several divisions of a county; if the county is regularly-formed a township is usually six miles square, and contains thirty-six square miles (see **LANDS, PUBLIC**).

In most states the executive officer of the township is a supervisor, in which case he represents the township on the county board of supervisors, the law-making body of the county. In other states there are township commissioners; sometimes these officers act independently of a county body, but often with and as a part of it.

Study of a Township. School children may systematically study a township from the following outline and suggestions:

The Township

(a) Political features

- (1) Map
- (2) Location in county
- (3) Names of surrounding townships
- (4) Number of school districts
- (5) Area (miles in each direction)
- (6) Location of villages or cities
- (7) Public buildings
- (8) Population
- (9) Government

(b) Physical features

- (1) Rivers
- (2) Creeks
- (3) Deep valleys
- (4) Plains
- (5) Heavy forest areas
- (6) Mountains or great hills
- (7) Lakes
- (8) Swamps

It may be difficult to learn the physical geography of the entire township, for neither pupils nor teacher may have personal knowledge of the facts, and the subject is one on which it is impossible to read in books.

Months will pass in learning the facts relating to local geography as above explained and outlined, and this is well. Relatively small children must not be required to push their investigations far beyond their immediate surroundings. To attempt excursions too far distant invites confusion. Introduce larger political units for study only when the boys and girls are prepared by knowledge of the township to understand the step.

TOXICOLOGY, *toks i kol'o jy*, the science that treats of the nature of poisons, their effects and antidotes, and also of the legal questions arising from poisoning. See **POISON; ANTIDOTE**.

TOXINS, *tok'sinz*, poisonous substances which are created in the body through the agency of germs. Under certain conditions they act upon the tissues and produce symptoms of various infectious diseases, such as diphtheria, meningitis and lockjaw. Antitoxins (see **ANTITOXIN**) are substances which neutralize the effects of toxins. See **SERUM THERAPY**.

TRACERY, *tra'sury*, in architecture, a term which denotes the ornamental decoration used most frequently in a window or gallery. Tracery as an art was first practiced in Gothic architecture during the first part of the thirteenth century in France. It was developed in the windows, but gradually extended to almost every part of the church buildings. Styles varied in different ages and countries and are known as geometrical, flowing and flamboyant.

TRACHEA, *tray'kea*, the windpipe or principal air passage of the body. It begins with the larynx, through which it communicates with the mouth and nose, and it ends with the bronchial tubes, through which it communicates with the lungs. In man this tube is about three-fourths of an inch in diameter and four and one-half inches long, and it consists of an external fibrous membrane and an internal mucous membrane. Enclosed between these membranes there are from sixteen to twenty rings of hard cartilage extending only around the front and sides of the trachea. Between the ends of these rings and attached to them, extending transversely, is a layer of unstriped muscle, whose function is to decrease the size of the tube, by drawing the ends of the rings nearer together.

The surface of the mucous membrane is covered by a layer of cells, each bearing a tuft of tiny hairs or cilia. The cilia move in such a direction that anything resting on them is drawn toward the mouth. In this way phlegm is removed. Many mucous glands pour their secretion upon the surface of the interior.

TRACHEOTOMY, *tra ke ot' o my*. See **CROUP**.

TRACHYTE, *tra'kite*, or *trak'it*, a volcanic rock containing potash, feldspar, lime, soda and hornblende, together with an oxide of iron and manganese and a few other minerals in small proportion. In composition it is similar to syenite, but in appearance resembles porphyry, on account of the large

crystals of feldspar scattered through it. Trachyte is usually light-colored, but it may be of any shade of gray, or black. The rocks of this class are found in South Dakota, Colorado, Montana and Wyoming, but more generally distributed in Europe, where they are found in Italy, France and Germany.

TRACTARIANISM. See **OXFORD MOVEMENT**.

TRACTION ENGINE, or **TRACTOR**, a self-propelling steam engine, designed to haul and operate farm machinery, and sometimes used for hauling wagons and vans over common roads. The typical traction engine was once a high pressure engine with a horizontal boiler, the whole device mounted upon four wheels, and many of this class are yet found. The rear wheels are large and broad and have the tires constructed to prevent slipping. The forward wheels are connected with a steering apparatus. The engine is horizontal and is attached to the top of the boiler. It has an adjustable gear, by which it can be attached to the rear wheels when it is desired to propel the engine over the road. When the engine is used for operating machinery, this gear is detached.

Since the perfection of the internal combustion engine, many types of tractor have been invented, and these are finding great popularity on farms. They are made on the automobile principle, with bodies designed for various kinds of farm work. Those most generally purchased by farmers use a less expensive fuel than gasoline—such as kerosene or distillate for power. The *caterpillar* pattern is popular with many farmers because of its great hauling power, and because, like the tanks used in the World War, it can pass over ground where tractors of the ordinary type cannot be used. See **TANK, ARMORED**.

TRADE ACCEPTANCE, a commercial term used to designate a particular form of credit, and defined as "a time draft or bill of exchange drawn by the seller of a bill of merchandise on the buyer for the purchase price of the goods, and bearing on its face the signed acceptance of the buyer with the date and place of payment."

To illustrate: A. B. Smith & Company of Boston, sell to J. M. Hardy & Company, of Chicago, a bill of merchandise amounting to \$2,500. The time draft for this amount accompanies the bill of lading. J. M. Hardy & Co. stamp *Accepted* across its face, desig-

nate the date and place of payment and return the draft to A. B. Smith & Co., who may hold it until it becomes due or discount it at the bank.

Trade acceptance is a comparatively new method of merchandising in America, having originated in 1917, but it has been in use in other countries for a long time. It is indorsed by the Chamber of Commerce of the United States, the American Bankers Association and the National Association of Credit Men. It is claimed for it that it makes for better business, creates a better class of accounts, insures more prompt attention to payments when they become due, and extends the use of negotiable paper.

TRADE-MARK, an emblem or device, used by manufacturers to distinguish their productions. Such marks have been in existence for centuries, but it is only in recent years that they have been legalized. They may now be registered and protected in all the more important countries and even by citizens of one country in another. According to the trade-mark statutes of the United States a mere descriptive title or a geographical name does not constitute a proper trade-mark; it should be some invented word or words, distinctive device, figure, emblem or design, or a written signature. Any mark or name calculated to mislead as to the real name or origin of the goods is invalid. Trade-marks are registered at the Patent Office, at a fee of \$25, the right running for thirty years.

TRADE UNIONS. See LABOR ORGANIZATIONS.

TRADE WINDS, perpetual or constant winds which occur in all open seas on both sides of the equator, for a distance of about 30° north and south of it. North of the equator their direction is from the northeast, with occasional slight variations; south of the equator they proceed from the southeast. Their importance to ocean commerce before the days of steam navigation gave them the name of *trade winds*.

These winds result from the differences in temperature between the equatorial and polar regions. The heat of the torrid zone causes the air there to become lighter and consequently to rise. As it rises the cooler surface air north and south of it rushes in to take its place. This movement of air is constantly going on. The oblique direction of these winds is accounted

for by the fact of the earth's rotation. The belt between the two systems of trade winds is a region of calm, which, in the days of sailing vessels, was dreaded by mariners. This belt shifts somewhat with the seasons.

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TRAN'SEPT. In many Christian churches the central floor space is in the form of a Latin cross, with the central aisle leading to

the altar and a broad aisle crossing it there. This cross aisle, corresponding to the arms of the cross, is called the transept.

TRANSFORMER, a device used for changing the potential of electric currents. The transformer in most common use changes the current from a high to a low potential and is a form of induction coil (see **INDUCTION COIL**), in which the inner, or primary, coil consists of many turns of fine wire, with an outer, or secondary, coil of a few turns of coarse wire. This transformer is used in electric lighting, for reducing the potential of the current as it is taken from the main wires for supplying incandescent lights in buildings. See **ELECTRIC LIGHT**.

TRANSFUSION OF BLOOD, an operation consisting of the injection into one person of blood taken from another. The transferece may be direct, that is, from vein to vein; or indirect, with the blood freed from fibrin and injected from a receptacle. The operation is useful in restoring the strength of a person who has suffered loss of blood from hemorrhage or surgical operations, and in cases of gas poisoning, burns, cancers and other disorders involving irregular blood conditions.

TRANSIT, in astronomy, 1, the passage of a heavenly body across the meridian of any place, a phenomenon which is usually noted by a transit instrument. The determination of the exact times of the transits of the heavenly bodies across the meridian of the place of observation enables the astronomer to ascertain the differences of right ascensions, the relative situations of the fixed stars and the motions of the sun, the planets and the comets, in respect to the celestial meridians. 2, The passage of one heavenly body over the disk of a larger one, this term being usually restricted to the passage of the inferior planets, Mercury and Venus, over the sun's disk. The transits of Venus are of great importance in astronomy, as they afford the best means of determining the sun's parallax and consequently the dimensions of the planetary system. The transits of Mercury are of far less astronomical interest, the planet being too distant from the earth to be used for purpose of measurement.

Transit Instrument, an astronomical instrument, adapted for observing the exact time of the passage of heavenly bodies across the meridian. It consists essentially of a telescope, fixed at right angles to a horizontal

axis, which latter has its ends directed exactly to the east and west points of the horizon, so that the optical axis of the telescope may move in the plane of the meridian. A thread passing across the center of the object glass parallel with the plane of the meridian, enables the observer to note, to the fraction of a second, the time of the passage of a star.

TRANSIT OF VENUS. See **VENUS**, sub-head *Transit of Venus*.

TRANSMIGRATION, *trans mi gra' shun*, **OF THE SOUL**, or **METEMPSYCHOSIS**. Many persons believe that after the body dies the soul passes into some other material form—into other human bodies, or even into the bodies of lower animals. In the teaching of the Brahmanic Hindus, the doctrine of transmigration has its foundation in the belief of the connection of all living beings and of the gradual purification of the spiritual part of man and its return to the common source and origin of all things—God. The Buddhists accept a similar doctrine, but with them, the ultimate goal of the soul is not absorption by the Deity, but annihilation, Nirvana.

Transmigration also formed part of the teaching of the early Egyptian priests. The doctrine probably passed from Egypt into Greece, where it was never generally current, but was confined to the mysteries and some philosophic systems. It occupied an important place in the system of Pythagoras and is supported by Plato and Plotinus. Among the Romans, Cicero alludes to this doctrine, and Caesar informs us that it was believed in by the Gauls, who, he says, in this faith were able to despise death. The doctrine is also found in the Talmud, but only a minority of the Jewish rabbis appear to have adopted it. Various heretical Christian sects have held this doctrine, and it was also professed by the Arabs before Mohammed.

Many men of profound metaphysical genius, both in Europe and America, have supported this doctrine and attempted to give it a logical or scientific basis, and for a large class of persons it has a strong attraction.

TRANS-SIBERIAN RAILWAY, a line of railway connecting the transportation systems of Russia with the port of Vladivostok, on the Sea of Japan, until 1918 the most eastern outpost of the great Russian empire. The Trans-Siberian Railway was the outgrowth of a number of projected plans for establishing means of communication

between the Russian possessions in Europe and Asia. Its construction was approved by an imperial rescript given by the Czarovitch, later Nicholas II, March 17, 1891. Work was commenced immediately, and the main line was completed in 1905. The line as

of normal width and is everywhere substantial. Drainage is secured by means of iron and clay pipes; bridges over culverts and small streams are solidly built of stone or wood, but those over the large rivers are of the best patterns of steel truss. The bridge



originally planned was divided into six sections, as follows: Western Siberian, from Chelyabinsk to Omsk, 378 miles; Central Siberian, from Omsk to Irkutsk, 1,134 miles; Trans-Baikal, from Myosava to Stretensk, 685 miles; Amur, from Stretensk to Khabarovsk, 1,373 miles; Usuri, from Khabarovsk to Vladivostok, 474 miles. The Amur section was later replaced by a line running farther south through Manchuria, known as the Manchurian Section. This section extends 952 miles from Nagaden, where it leaves the main line; it also has a southern branch extending to Port Arthur, thus giving the railway access to a port which is free from ice the entire year. The distance from Chelyabinsk to Vladivostok is 3,961 miles, and to Port Arthur, 4,238 miles. The entire system has 6,800 miles of road.

The Western Siberian division passes through a level country and proved easy of construction, but the Trans-Baikal division presented great engineering difficulties, in the way of apparently bottomless marshes and mountainous regions requiring steep gradients. Owing to the time required for constructing the road around Lake Baikal, the line was opened to traffic before this section was completed, and for nearly three years cars were transferred across the lake by ferry. The roadbed is planned for rails

over the Irtysh River is nearly four miles long and is considered one of the finest railway bridges in the world. The stations along the line are commodious in plan and artistic in design; they are placed thirty-three miles apart.

The Trans-Siberian railway is the greatest project of the kind that has yet been carried to successful completion. By the old routes of travel it required forty-five days to go from Saint Petersburg to Peking, by the Suez Canal and the Indian Ocean, or thirty-five days via New York, San Francisco and the Pacific. By the Siberian railway, one can go from Moscow to Vladivostok in nine days.

During the World War, especially following the downfall of the autocracy, the Trans-Siberian Railway was of great strategic importance. After the Bolsheviks seized the power in Russia the Siberian portion of the road came under control of the allies and the anti-Bolshevik Siberians. In the spring of 1919 an allied commission was formed to rehabilitate the road. A prominent member of this commission was the American railway expert, John F. Stevens. See SIBERIA.

TRANSVAAL, *trans'vahl*, **THE**, a province of the Union of South Africa, extending from the Limpopo River, on the north, to the Vaal River, on the south. The name means

across the Vaal. The province is bounded on the east by Portuguese East Africa, on the west by Bechuanaland, on the south by Orange Free State and on the north by Rhodesia. With an area of 110,426 square miles, it is about as large as Nevada, and about four times the size of the Canadian province of New Brunswick.

The People. According to the census of 1911, the Transvaal had in that year 1,686,212 inhabitants, of whom 420,562 were whites. The majority of the whites are Boers, or South African descendants of the early Dutch settlers. The native peoples are tribes of the Bantu family, and are of the negroid type. Most of these tribes still maintain their customs and tribal government, but many of the men are in the service of the colony as laborers in the mines and on farms. Pretoria, the capital, and Johannesburg, the mining center of Witwatersrand, are the largest cities.

Surface and Drainage. Most of the country is a high, undulating plateau, with hills and mountain ranges extending through the interior. The tableland varies in height from 4,000 to 6,000 feet, in the south and east, to between 1,500 and 4,000 feet, in the north. The Drakensberg Mountains extend north and south across the eastern portion and reach an altitude of 8,700 feet in Mauchberg Mountain, the highest peak. The boundary between Transvaal and Portuguese East Africa is formed by the Limpopo Mountains. The Witwatersrand is a height of land, gradually rising to an altitude of 6,000 feet, extending across the country approximately in an east and west direction, and forming the watershed between the Limpopo and the Vaal rivers. The southwestern part of the colony is a broad, flat plain. The chief rivers are the Vaal and Limpopo, with their tributaries.

The climate is temperate and, in the main, healthful. It is characterized by intense heat during the summer and by heavy rainfall. These conditions produce malaria in the lower levels, but the winter months are cool and invigorating. The annual rainfall is about 26 inches.

Industries. The settlers are largely engaged in stock raising and agriculture. All of the cereals and most vegetables are produced in paying quantities. Corn and tobacco are the chief crops. Extensive grazing regions adapt this country to stock growing, and large numbers of cattle, horses,

sheep and goats are found in the colony. The mineral wealth, however, is the chief source of income. This consists of gold, which is extensively mined on the Witwatersrand, in the vicinity of Johannesburg and Barberton, and of diamonds, which are obtained in the vicinity of Pretoria. The gold taken from the mines in 1918 was valued at over \$189,000,000; and the annual output of diamonds is about \$20,000,000. The province has over 2,360 miles of railways, which connect Pretoria, Johannesburg, Pietersburg and Leydenburg with the chief towns in Orange Free State, and these are connected with the trunk line of the Cape-to-Cairo Railway.

Government. The executive head of the government is the administrator, appointed by the governor-general for a term of five years. The administrator presides over the meetings of the provincial council, composed of thirty-six members elected for three-year terms. An executive committee of four, not necessarily members of the council, acts as cabinet or ministry. The provincial council may legislate on all local matters, including finance, elementary education, agriculture, roads and bridges, and municipal institutions. All legislation is subject to the veto of the governor-general-in-council. The province sends eight senators and forty-five representatives to the Union Parliament.

History. The Transvaal was settled by Dutch emigrants from Cape Colony in 1835 and 1836. These people emigrated northward because they were dissatisfied with the British rule in Cape Colony. Because of wars with the native tribes, the colonists were compelled to apply to British authorities for protection. This was granted, and it became necessary for the British government to assume control of the colonies, in order to preserve peace with the native tribes. To this arrangement the colonists agreed in 1877. Afterwards they protested against annexation to the British dominions, and in 1880, under the Gladstone ministry, it was recommended that the political independence of the country be restored. The South African Republic was proclaimed by the people, in December, 1880. In 1881 a convention was signed by Great Britain, granting independence, except in external affairs. This was superseded by another convention in 1884. Meantime, the Boers were preparing for war, and in a short campaign they administered a serious defeat

to the British troops. With the discovery of gold in Witwatersrand, in 1884, there came a large influx of foreigners, who settled about the mines. The discovery of diamonds also caused an increase of foreign population, and the Boers became alarmed lest these foreigners, *uitlanders*, outnumber the original citizens and assume control of the government. In order to prevent this, the South African Republic refused to grant foreigners franchise and certain other rights, except under great restrictions and difficulties.

The excess led to another, until war was declared in October, 1899. The Boers were defeated, and the South African Republic, under the name of Transvaal Colony, was annexed to the British dominions, on September 1, 1900. Until 1905 the government was under the control of an administrator; but local government was being reestablished, and complete self-government was restored in 1907, when the first responsible ministry took office. On May 31, 1910, when the Union of South Africa was established, the Transvaal became a province.

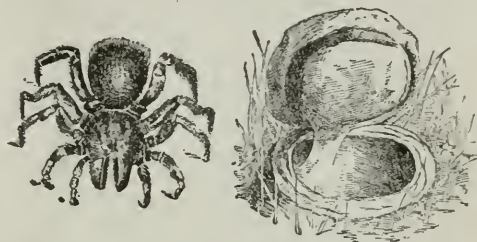
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Boer	South African War
Cape-to-Cairo Railway	Union of South Africa
Johannesburg	

TRANSYLVANIA, *tran sil va' nia*, from 1867 to 1918 a territory belonging to the Hungarian Crown, occupying the southeastern corner of the kingdom. It has an area of 21,518 square miles. On the east and south it is bordered by the Carpathian Mountains, which separate it from Rumania. Rumania laid claim to Transylvania at the close of the World War, as over half its people are Rumanians. There is a small German minority. The nobility and gentry, however, are Hungarian, or Magyar, and among those classes opposition to annexation developed. The disposal of the region was to be decided by the peace conference. Transylvania is generally mountainous, but it has a fertile soil and produces wheat, barley, rye, oats, flax, tobacco and fruits. Stock raising is a profitable source of income, and horses of superior breed are exported. The region is famous for its scenery, and is of great interest to tourists because of the variety and charm of the peasant life and costumes. See HUNGARY; RUMANIA; WORLD WAR.

TRAPDOOR SPIDER, a name given to certain spiders that have the habit of constructing tubular dwellings in the ground,

sometimes a foot or more in depth and an inch or so in diameter, and closed by a kind of hinged door. They belong to warm climates and are found in Southern Europe,



TRAPDOOR SPIDER AND HIS HOME

Western North America and North Africa. The dwelling is lined with the silky substance spun by the spider and the hinge of the door is formed of the same, the door itself being constructed sometimes of earthy particles connected by threads, sometimes of leaves and twigs. When the spider is alarmed it runs into its tunnel and hangs to the closed door by its jaws. These spiders are large and belong to the tarantulas. They feed upon wingless insects, and sometimes upon earthworms and caterpillars.

TRAPEZIUM, according to Euclid, a quadrilateral having two of its sides parallel. In the United States it is a four-sided figure having none of its sides parallel. The area of the latter figure is computed by multiplying the length of the diagonal by one-half the sum of its altitudes.

TRAPÉZOID, a quadrilateral of which no two sides are parallel. The term is usually reversed in the United States and made to mean four-sided figures with two parallel sides. With the latter definition, the area is equal to one-half the sum of the parallel sides, multiplied by the altitude.

TRAPPING, a sport for residents of rural districts and still a resource of the hunter in the far north, is the taking of birds and animals by traps, or snares, instead of killing them with weapons. Traps are of various kinds, such as the nets that are used for fish; the snares and box traps, to imprison birds and quadrupeds; the dead-fall, which kills by weight, and the steel spring traps, which in various sizes are used for all animals, from the mouse to the bear. The steel trap is the most cruel of all, because it does not usually kill, as does the dead-fall, nor imprison an animal, as the box traps do, but catching only by the leg, holds its captives in suffering

till they are killed and released by the trapper. Some animals when caught by a foot in a steel trap will release themselves by gnawing off the imprisoned member; this is most common among muskrats, and accordingly, hunters set their traps so that the animal will drown soon after being caught.

TRAPPISTS, a branch of the Cistercian Order of monks, one of the most rigorous of the Roman Catholic Church. The Order had its origin in France in 1664, but was expelled from that country at the time of the Revolution, and again in 1903. Their monasteries are found in different localities in Europe, Asia, Africa and North America, in all numbering about seventy-five, with a membership of 4,000. The Trappist is under a vow of perpetual silence, except when it becomes necessary to speak to guests. He sleeps in his habit, removing only his shoes; much time is spent in meditation and prayer, and several hours a day at hard labor.

TRAVELS IN DISTANT LANDS. In the following pages the reader is invited to go in imagination to four of the most interesting places on the globe—Japan, the Philippines, the Hawaiian Islands and the Lesser West Indies.

Japan, "Land of the Rising Sun." As your steamer is finishing the last lap of that long journey across the Pacific, you might profitably look into the guide book for a few statistics regarding the empire you are approaching. On the map Japan seems to be a long string of islands standing guard before China and Manchuria. No wonder some of the islands are mere dots, for all told they number over three thousand. From the most northerly of the Kuriles to the extreme southern point of Formosa they extend over a distance of something like two thousand miles. If you plucked them out of the Pacific and swung them across the United States, with the Formosa extremity anchored at San Francisco, the Kuriles would land somewhere in the vicinity of Chicago. We are especially interested, however, in the four large islands south of the Kuriles, for they constitute the vital part of the empire. Here live the Japanese proper, with their love of art and beauty, and their quaint and curious customs.

The traveler bound for Japan's largest city and seat of government—Tokyo, on Hondo Island—finds himself landed at Yokohama, eighteen miles to the south of the great city.

Though it has the distinction of being both the capital and the metropolis of an empire, Tokyo has no suitable harbor for large ships, and Yokohama serves as a port. It is no matter, since railroads have long since found their way into the Orient.

As you step off the steamer dock you hear a dozen voices clamoring for your baggage, just as in the world you left behind you, but what you imagine to be the equivalent of "Cab here," is, no doubt, "Jinrikisha." At least you soon find yourself and your luggage safely bestowed in one of these interesting vehicles, and are rapidly borne away at a dizzy rate of speed to the station of the "Tokyo tram."

The trip to Tokyo is short. The train passes quickly through a level country devoted chiefly to rice fields and truck gardens, varied now and then with a quiet village of low houses. Arrived in the capital city, you again entrust your life and property to the tender mercies of a coolie, and are "rikishawed" through a labyrinth of streets and alleys to your inn. While you are enjoying this novel ride in a two-wheeled perambulator, take a look about you.

Tokyo seems a hit and miss city, and well it may, for it has had a tempestuous history. Born a fisherman's hut on the marshy shore of a shallow bay, it grew into a fishing village, expanded from that into the residence of the shoguns, and finally became the capital of the empire. But this growth—from a hut to a city of over 2,000,000 inhabitants—was not an uninterrupted affair, for earthquakes, fires, floods and pestilence have repeatedly destroyed thousands of homes and their inmates. Each great disaster has been followed by a widening of some of the ancient thoroughfares, and an attempt has been made to defy the earthquakes by means of steel and concrete buildings of moderate height. However, the low, broad structures are still by far the most numerous, and there are no skyscrapers, or tall towers or lofty spires. The streets are a bewildering maze of the old and the new, for the widening process has not progressed far enough to have achieved uniformity. Except in the newest quarters, sidewalks are dispensed with as a useless luxury; in fact, some of the streets are so narrow a sidewalk would be an impossibility.

The area of Tokyo, according to a recent city handbook, is about thirty square miles. It must have been difficult to estimate this

area, because of the persistence of the suburbs in nosing their way into the heart of the city. A suburb, as every Westerner knows, is supposed to grow up and settle down on the outside of a city, but Tokyo suburbs have



A JAPANESE LITTLE MOTHER

a way of maintaining themselves on the inside. However, suburb or city, it is all very fascinating to the traveler perched on the high seat of the 'rikisha, watching the swift-footed coolie thread his way through the crowded streets.

The 'rikisha men are by no means the only biped burden bearers. Two-wheeled carts containing merchandise of every description, and drawn by the head of the family, are everywhere seen. A willing wife—helpmate in a literal sense—trudges behind and pushes, while the young son and heir placidly sleeps on his mother's back. Porters with incredibly heavy loads on their shoulders, street peddlers, bicyclers, now and then a motorcycler, laborers, school children, tourists and their guides, shoppers, beggars—in fact, a throng as hit and miss as the city itself presents a perpetual moving picture to the onlooker. In addition, there are a few street cars, but, as one experienced traveler has said, "It gives us a shock every time we meet a street car in Tokyo; they are abominably out of place, exasperatingly deliberate, usually overcrowded, and astonishingly cheap. The picturesque, speedy and exclusive 'rikisha is comparatively expensive, but let us

hope it will successfully resist its rival, for a Japanese city without it would be indeed a sorry place."

Having had an interesting journey through Tokyo streets, you will next seek the hospitality of a Tokyo hotel. One may put up at any of several hotels conducted on the Western plan, but who wishes to travel across the Pacific for the privilege of doing what may be done at home? Life in a Japanese hotel is brimful of interest, and its discomforts depend entirely on one's mental attitude. When you enter you take off your shoes, for the Japanese are extremely particular about having dirt tramped into their spotless houses. Provided with house slippers on the sandal order, you are conducted to a room containing no chairs, no bed, no dresser, no carpet, no writing desk—not anything a hotel room is supposed to contain. A mat or two, a screen, a picture—that is about all the furniture.

You arrange yourself on a mat, tailor-fashion, and make a desperate effort to train your legs to assume the folded attitude, for so long as you are a guest in a Japanese hotel you cannot sit on a chair. There is none to sit on. A dainty maid enters the room and proceeds to make you comfortable with fire and food. Furnaces are unknown in true Japanese houses, but heat is carried about from place to place in a charming firepot. This receptacle is partly filled with ashes, in the center of which there is heaped up a miniature volcano of hot charcoal. A dining table, consisting of a small tray elevated on legs a few inches high, is brought in and spread with food. You eat, perhaps, fish, soup, boiled bamboo shoots, sweet bean cakes and rice, and everything must be conveyed to the mouth with chop sticks. Knives, forks and spoons are nowhere in evidence. The meal is finished off with a few bowls of tea, brewed through the agency of a gridiron placed over the charcoal volcano, and a tiny teapot.

Going to bed also has its novelties. The dining tray is removed after the meal is concluded, and the room is converted into a sleeping chamber by the simple process of having the bed brought in. A Japanese "boy," who may be anywhere from twenty-one to seventy-five years old, takes it out of a compartment in the wall, and the dainty maid makes it up. It, by the way, consists of three thick pads and a sheet on which you lie, and two heavy quilts which lie upon you, the

quilt next above you being lined with a sheet. The pillow is a sort of hard roll upon which the tourist's head somewhat uneasily rests.

It is a part of the maid's duty to disrobe the guest at bedtime, and array the drowsy one in a picturesque kimono. At any rate, she will remove as many of your garments as your Western ideas of propriety will permit.

Throughout all of your sojourn in the hotel you will be impressed by the extreme courtesy of the servants. One and all, they bow down before the guests with untiring grace and agility. If you are fortunate enough to be entertained in a private home you will learn as never before what true hospitality means. The Japanese will accept utter strangers into their homes and urge them to remain indefinitely. Politeness seems to be an inborn trait, and it is reflected in the serene and peaceful countenances of these interesting little people. It is said that in some of the remoter villages children on first viewing American or European travelers cry out in terror at the cross looks of the strangers. Even a funeral is carried on with cheerful decorum, for it is a breach of etiquette to depress the world with signs of grief.

Westerners marvel especially at the politeness of the train officials. A traveler relates that while he was journeying from Tokyo to Nagoya he noticed the conductor bowing to the passengers in the coach, and making a sort of sucking sound by drawing in his lips. (This practice of hissing, by the way, is a common sign of etiquette in Japan.) The passengers in turn bent their heads and began to make the same noise, "as if everybody had begun to eat soup." After a few minutes everyone sat at attention, while the conductor made some kind of an announcement in a dignified voice, and bowed himself out. On being asked the meaning of this strange performance, a native seated next to the Westerner told him that the conductor had merely announced the next station.

Traveling on the train in the mikado's realm has its joys, but the ideal way to see the country is to journey in 'rikishas. Runners may be procured for a reasonable sum, and they will literally run for days in rain or shine, over the worst roads, and never seem to tire or grow irritable. The country roads in Japan are unspeakably bad, but the 'rikisha men are a cheerful and a "husky" lot. The country scenery possesses wonderful

charm. Japan is a land of mountains, green vales, lakes, cascades, rushing streams, ravines and lovely woodlands. You may wander through endless villages, always quaint and clean, always filled with the same happy, contented people. Sometimes you come upon acres of mulberry bushes, and again there seems to be no end of rice fields. The way-side teahouses, whose daintiness and beauty must be seen to be appreciated, are numerous and inviting, and there are unknown numbers of shrines and temples, of artistic interest even to the skeptical foreigner. Probably the average traveler leaves the island empire with a very definite impression of beauty. As his steamer sails away and he looks regretfully back there meets his eye the cloud-kissed summit of the ethereal "Peerless Mountain"—Fujiyama; so to the last Japan weaves its spell of enchantment.

In and About Manila. Not long ago an enterprising hemp buyer was conversing with a group of travelers on board a steamer approaching the Philippines. "When I first went to Manila," he said, "back in the eighties, the place was nothing but a death trap. Now it is a health resort." The journals of those courageous Americans who took up the task of remaking the islands after the Spanish-American War bear out the hemp buyer's testimony: they are full of references to heat, disease, insects, poverty and squalor. True, the climate of these Oriental lands cannot be changed, but after viewing the results of twenty years of colonization one comes to the conclusion that the prevalence of disease in the Far East is more a matter of unsanitary conditions than of climate.

It is a beautiful and healthful city that lies in dim outline against the distant horizon, as our steamer crosses the entrance of Manila Bay. The bay is almost large enough to be called a sea, though it is land-locked, and in stormy weather its waves are like those of the ocean. As we draw nearer we can make out the picturesque walls of Old Manila—Intramuros it is called—the suburbs scattered along the shore, and in the background a semi-circle of lovely mountains. A river—the Pasig—winds down to the bay, separating Intramuros from the suburban sections, and when our steamer comes to the dock we notice at the mouth of the stream a low fortress. This is Fort Santiago, where in the days before the war, the Spanish were accustomed to imprison Filipino rebels.

The aspect of the old walled city is charming, for the work of cleaning up to which the Americans applied themselves so vigorously has not deprived the city of its Spanish character. The picturesque walls and stately gates are there intact, except for a short section along the Pasig, and the foul-smelling, stagnant moats, once the breeding places of hordes of mosquitoes, have been drained and filled up. In their stead are charming parked areas and driveways. Within the walls we find the churches, monasteries, convents, public buildings and homes of the Spanish régime—attractive examples of Spanish architecture modified by a tropical climate. As a protection against the heavy downpours of the wet season the windows are often shaded by overhanging eaves and canopies, and charming galleries are built around the buildings to keep out the intense heat. Ventilation is absolutely necessary in the tropics, and this is assured by wide windows, high ceilings and sliding screens for walls. Another interesting feature of the typical Filipino building is the conch-shell

with the finest in Europe or America. A traveler who visited Manila shortly after the close of the war of 1898 tells of his experiences in the "best hotel" of that period. Hopefully viewing the bills of fare for breakfast, he "passed up" the first two items—watery gruel and Oriental beefsteak—and called for an omelette. There were, by the way, six egg dishes listed, and he felt safe in making this choice. One can imagine his feelings when the grinning Chinese waiter remarked, "No have got eggs." In those days ice was a commodity, rare and precious, and about the only safe beverage for a white man to drink was American beer. Through the modernization of Manila the Westerner now has practically all the comforts of home.

Not the least of the wonders of the bay shore is the wide, handsome boulevard which skirts the sea for fifteen miles, from the Luneta to the naval station of Cavite. The Luneta, just outside the walls of Old Manila, is an oval-shaped pleasure ground, the chief promenade of the residents during the Spanish régime. It has been enlarged and beauti-



CLEAN, SANITARY LIVING TAUGHT BY AMERICANS

window pane. The soft translucency of this material shuts out the fierce glare of the sun and provides a soothing, mellow light.

The Americans have performed wonders with the bay shore. Large sections have been reclaimed from the sea, and a group of stately government buildings and a mammoth hotel have risen on the new sites. The new Manila Hotel, fronting the bay, is worthy to rank

with the finest in Europe or America. A traveler who visited Manila shortly after the close of the war of 1898 tells of his experiences in the "best hotel" of that period. About seven miles to the south, along the new boulevard, a polo club house has been erected, and the polo grounds are among the finest to be seen anywhere.

The commercial and industrial center of the Filipino capital is called Binondo. It

lies directly across the Pasig from Intramuros, and is a busy place, with its tobacco factories, business houses of the trading companies, and shops. The Escolta, a narrow street that nevertheless seems to be Manila's Broadway, is a most interesting place. Electric cars are whizzing by, and everything suggests American hustling energy, but one is occasionally brought sharply back to the lazy past. There goes a slow-moving carabao hitched to a two-wheeled cart. The driver, a Filipino lad in picturesque red trousers and big straw hat, acts as if time and tide would wait for man indefinitely. At the time of the American occupation these carabaos—water buffalos—were prominent features of Filipino street life. Though they had the habit of knocking off from work whenever a nearby pond or moat proved inviting, their deliberate ways were not objectionable to their equally lazy masters.

Tondo, adjoining Binondo on the north, is the suburb of the poorer classes. When the Americans occupied the islands they found unspeakably bad conditions in the sections occupied by the laborers. Houses were crowded together without any regard for air and light, garbage and waste accumulated in the streets and under the houses, there was no drainage or sewerage system, and drinking water was obtained from infected springs or filthy canals. The accompanying picture gives one an idea of results of the sanitary campaign. The native houses, made of bamboos and grass, are placed far enough apart to give good air and light, and a modern sewage and dumping system takes care of refuse. The people live in clean, wholesome quarters, and have been taught the basic principles of sanitation. The government filled in the disease-breeding sources of water and sunk hundreds of artesian wells, so that there is an abundance of pure water for everyone.

In San Miguel, built on an island formed by an arm of the Pasig, one may see numerous attractive homes of the wealthy class. Their houses would be considered sparsely furnished by the average Westerner, but this sparseness is a concession to the heat. The floors are made of huge strips of rosewood, mahogany and other tropical woods, and are kept in a high state of polish by Filipino "boys." Rugs, draperies, upholstered furniture and bric-a-brac have no place in a Filipino home. Visitors from the Western

world sometimes find that it takes time to appreciate the virtues of a Filipino bed. It has been called various names, including rack, implement of torture and inspirer of insomnia, but it differs from an ordinary bed only in such trifling details as the lack of blankets, springs, mattress and slats. In a climate where man fights a drawn battle with insects, heat and dampness, an American bed would be an absurdity. A Filipino bed, therefore, is a four-poster frame on which is stretched a piece of rattan. The latter is covered with two sheets and the whole is draped with mosquito netting, to protect the occupants from gnats, cockroaches and other undesirable visitors. As the beds are often elaborately carved they have artistic as well as practical value.

One of the most interesting places in the vicinity of Manila is the so-called summer capital—Baguio. Of this wonderful highland region, a mile above the sea, one Manila resident has written: "The heavenly coolness, the sweet pine air and the exquisite scenery give you new life after the years spent in the heat, glare, dust and smells of the lowlands." During the hot season—March, April and May—rich and poor alike hasten to this "Paradise among the pines," where the mean temperature for the warmest month is only 64°, and the thermometer never climbs above 80°. One of the finest highways in the world, the famous Benguet Road, winds in and out among the mountain gorges and permits you to enjoy an unsurpassed motor trip from the lowlands into cloudland. This highway was constructed by the American government at a cost of several million dollars. On the cool plateau a small town has arisen. Besides the buildings which house the government offices, there have been constructed an army post, a government hospital, a great observatory, schools, churches, rest houses, golf links and polo grounds, baseball fields, tennis courts, and many private residences. It takes about eight hours to make the trip from Manila to Baguio, when one travels by train and automobile.

About a day's sail from Manila is another interesting spot, the leper colony on the beautiful island of Culion. Here have been constructed hundreds of concrete houses for the patients, besides a town hall, a school, dining halls, hospitals, stores and warehouses. There are modern lighting, water and sewerage systems, and the inhabitants of the colony

have their own police force. Formerly victims of leprosy were permitted to mingle freely with the non-leprous inhabitants of all the islands, but it is safe to say that the scourge has been conquered even in the provinces where it once raged unchecked. In all, between 8,000 and 10,000 victims of the disease have been sent to Culion, and a few have been completely cured.

Before we say farewell to the delights of the Philippines, it might be profitable to get a bird's-eye view of the archipelago as a whole. There are more than 3,000 islands in the group, but Luzon, on which Manila is situated, and Mindanao have together more area than all the others combined. In fact, the greater part of the total area of the archipelago is condensed into eleven islands. Much has been said about the heat of the region, but this is offset by the sea breezes that blow in between and on the land divisions; another advantage is the fact that the seasons of greatest heat and greatest rainfall are not identical. Beautiful mountains are found on all of the larger islands, some reaching heights of 10,000 feet. Tropical vegetation abounds, and adds to the charm of the scenery. Now that American colonization of the islands has expelled disease, discomfort and barbarism from the greater part of the archipelago, the Philippines ought to become a popular winter resort for Western tourists.

Hawaii, "Paradise of the Pacific."

Probably nobody ever undertakes to write of the glories of the Hawaiian Islands without quoting Mark Twain's famous descriptive phrase: "The loveliest fleet of islands that lie anchored in any ocean." Another enthusiastic traveler says, "Conjure up a memory of a perfect May day, when sunshine, soft air and smiling Nature combine to make the heart glad, then multiply that day by three hundred and sixty-five, and the result is a round year of Hawaii. The Hawaiian Islands are semitropical, radiant and beautiful."

Into this land of blue skies and sunshine let us journey in imagination. Five days out of San Francisco the cry is heard, "Diamond Head in sight." This is a point of land sharply projecting into the sea from the island of Oahu, on which the capital city of Honolulu is situated. Diamond Head is four miles southeast of Honolulu, and is over 700 feet in height. At its foot is the world's

most famous beach, Waikiki, where surf riding, boating and bathing are offered with the acme of enjoyment. We eagerly lean over the deck rail as our ship speeds by, and try to make out the lovely villas hidden in the verdure along the shore.

Then, almost before we know it, we are in the little harbor of Honolulu. Surely there has been some mistake! Over a hundred automobiles are parked on the water front awaiting the incoming vessels, and we can see paved streets, electric cars, fine buildings, telegraph poles—in fact, all the unmistakable "earmarks" of a modern city. No, there is no mistake. Honolulu, with over 68,000 inhabitants, is as up-to-date as any other city under the Stars and Stripes, and it is far more beautiful than most American towns of its size. Where else does one find such luxury of vegetation? Walls and verandas are clothed in flowers of every hue, superb palm trees grow everywhere, and one lives constantly in a riot of color and perfume. The private dwellings of Honolulu are not unworthy of their exquisite background. Although the sugar kings are beginning to build mansions as stately as those of Pasadena or Newport, even the less pretentious Hawaiian homes are picturesque and charming. The Hawaiian *lanai* of the better-class residence is well worth special mention. It is a combination of veranda and drawing room, roofed with a trellis, carpeted with mats, and furnished with hammocks, wicker chairs, Chinese lanterns and similar accessories to supreme comfort and enjoyment. To recline and dream in one of these chairs on a balmy day (every day is balmy, for that matter) is the acme of earthly joy to a worn and haggard tourist.

We must not, however, spend too much time day dreaming in a *lanai*. Let us journey to some of the points of interest in this fascinating country. Strangely enough, there is only one good harbor in the Hawaiian archipelago, aside from that in which our steamer docked. That one is Pearl Harbor, about six miles west of Honolulu, and it is well worth inspecting. Imagine a beautiful inland lake, measuring six miles by three, and divided into four landlocked basins by peninsulas and a pretty little island. Before the entrance Nature placed a coral reef, as if to show what she could do in the way of creating a safe and attractive harbor. The United States government, gratefully accept-

ing this ideal site for a naval station, has opened a channel through the reef, and has constructed a huge drydock, barracks, repair shops, hospitals and other structures necessary to a first-class naval base. In the quiet water of Pearl Harbor the entire United States fleet could find safe anchorage.

Another kind of scene greets us at Waikiki Beach. Here, as Mark Twain says, "smoke-dried children clad in nothing but sunshine" sport in the waves, and the air is filled with the merry cries of the surf riders. The natives, who learn to swim before they can talk, ride the breakers on boards, but we who are more timid will try one of those long, narrow canoes. We will not capsize, for our slender craft is protected by heavy outriggers, fixed to the ends of the beams. The boatmen paddle out to a smooth spot in the sea, and there wait for a roller big enough to try the mettle of the crew. At last a mountainlike breaker comes toward us, and soon we are rushing shorewards on its crest, enjoying the swiftest and most exciting "chute the chutes" known to mankind.

Waikiki possesses an aquarium that contains specimens of all the fishes found in Hawaiian waters. They show all the colors of the rainbow and represent an infinite variety of size and shape.

Another interesting excursion is the motor trip to the Pali, a high precipice six miles from Honolulu, at the head of Nuuanu Valley. The panoramic view from the foot of this steep cliff is one never to be forgotten, for there is spread before one's eyes a glory of blue sea, verdant meadows, mountain and valley that cannot be described. The experience is literally a breathless one, for into the gap where the road from Pali begins its descent toward the valley, the trade winds blow with maelstromlike fury. "If you open your mouth too wide, you can't shut it again without getting under the lee of something," is Charles W. Stoddard's comment.

The Hawaiian Islands possess one of the newest and grandest of the great national parks created by the United States government. This one includes in its confines the largest active volcano on the globe—Mauna Loa; the highest peak in the Pacific islands—Mauna Kea, and the world's largest extinct crater—Haleakala. It is impossible to describe the Hawaiian National Park without using superlatives. This is purely a matter of justice. Mauna Loa and Mauna Kea are

both on Hawaii Island, the largest one of the Hawaiian group. It lies about 125 miles south of Honolulu, a comfortable steamship journey away. Passengers bound for Mauna Loa are landed at the port of Hilo, which enjoys the distinction of being the wettest town in the entire archipelago. Situated on the windward side of the island, it is continually being showered by the moisture-laden trade winds, but the showers frequently parade up and down the streets in orderly procession, so that the dry-loving tourist may get out of the rain simply by crossing the street. Mark Twain inquires, "What if the rain sifts down?—the umbrella tree is at hand."

Kilauea, an active crater on the slope of Mauna Loa, is the great show place of the island. It is reached by railroad and automobile, the railroad bringing one within nine miles of Volcano House, where room and board may be had. Kilauea is only 4,000 feet above the sea, as compared with 13,675 for Mauna Loa's summit, but when it is showing off, to use a tourist phrase, it is supremely magnificent. The crater is about eight miles in circumference and is several hundred feet deep. In the center is a pit about 400 feet in diameter, which is reached by a winding trail leading from Volcano House. How near one may approach the pit depends on its degree of activity. A traveler who visited it recently says, "The mass of writhing fluid looks like hell as pictured by old-time fire and brimstone preachers. As floating pieces of lava cool and crack, a series of red hot fountains burst through them, rising to a height of twenty or thirty feet. Out of the awful chasm there arise clouds of sulphur smoke, ever shifting with the constantly changing wind." To enjoy one of the sublimest spectacles afforded man on this planet, one should view Kilauea at night, when its splendor illuminates the whole sky.

The extinct crater of Haleakala is on the island of Maui, twenty-six miles northwest of Hawaii. The mountain rises over 10,000 feet above the sea level, and the trail up its slopes has an average inclination of 500 feet to the mile. Sturdy mountain climbers find it no easy task to make the ascent, but all hardships are forgotten when, at the end of the trail, the magnificent crater meets their view. It is a gigantic hole in the mountain summit—twenty-seven miles in circumference and with sides steeply sloping downward to a

depth of half a mile. Twenty extinct cones are scattered over the floor of the great crater, ranging from forty to one thousand feet in height. A traveler who spent the night in a small rest house on the brink, describes in these words the scene that greeted him at sunrise.

The great crater had filled with clouds during the night. In the gray morning light one could imagine that he was looking over an immense body of water. Clouds had settled around the mountain so that the view of the ocean was shut off. We seemed to be standing on an island with clouds all about us. The first rays of the sun were caught up by the mass of mist in the crater. In an instant the great pit was turned into a sea of fire. Back and forth flashed the light as it was reflected through the abyss of fog. Then as the sun rose the clouds began to take flight, like giant birds, and in a few minutes the crater was empty.

The three islands we have visited—Oahu, Hawaii and Maui—contain large and profitable plantations devoted to the raising of sugar and pineapples. The plantation laborers, made up largely of Japanese, Chinese, Portuguese, Filipinos, pure Hawaiians and



A HULA GIRL

mixed Hawaiians, enjoy steady wages, good housing and sanitary conditions. The filth, misery and poverty of the Far East are unknown in Hawaiian country districts. Schools have been established for the children of the

laborers, and one teacher reported that in his school there were fifteen different nationalities. It is interesting, yet a matter of regret, to know that the pure-blood Hawaiians are slowly but surely dying out, and the time is not far distant when the native race will be only a memory. The pure-blood natives are a well built people, fond of athletic sports and of music. Their famous Hula dance, sometimes seen in a degraded form, is also dying out, but occasionally a tourist is fortunate enough to see it in its primitive grace, given by girls clad in dresses of grass and flowers.

The Hawaiian archipelago is a land of many blessings. Its people are whole-hearted in their loyalty to the American government, and even the old Queen Liliuokalani, though unreconciled to the loss of her throne, flew the Stars and Stripes from her palace when she heard that the United States had entered the great war. It is hard to leave these islands of peace and beauty, but we know that they will remain on guard in the Pacific, and welcome us again sometime in the days to come.

Among the Lesser Antilles. A week's steamer journey southeast from New York brings you into the heart of a chain of small islands that dot the Atlantic from Porto Rico to the South American coast. They are not nearly so well known as Cuba, Porto Rico, Haiti or Jamaica, their greater sisters of the West Indies, but they have a charm and picturesque beauty that lift them far above the commonplace. At the northern tip of this necklace of summer isles lies the group that appeared on all maps made before 1917 as the Danish West Indies. On March 31, 1917, the Danish flag floating on the flagstaff at Charlotte Amalie, island of Saint Thomas, was hauled down, and the Stars and Stripes were run up in its place. On that date the Danish West Indies became officially the Virgin Islands of the United States, and in visiting them we are viewing the newest possessions of the great American republic. To acquire them the United States paid Denmark the sum of \$25,000,000.

Although there are fifty islands, all told, in the group, only three are large enough to be known by name to the outside world. These are Saint Thomas, Saint John and Saint Croix. Saint Thomas, our first landing place, is an island of green hills. As we sail into the magnificent harbor of Charlotte Amalie,

the only port on the island, we are treated to a charming picture. The town climbs upward from the shore on three hills, and its white houses with their red roofs make a pretty patch of color under the blue sky. A huge drydock and coaling docks remind us that Saint Thomas will be of great value to the United States as a coaling station, especially for ships bound for the Panama Canal.

All of the people, white and black, are hospitable and courteous, and it is pleasant to find everyone able to speak English. The little town is delightfully clean, and it has a restful atmosphere that is very soothing. The one straight street runs east and west along the waterfront, and here one may buy the typical products of the island, such as cigars, bay rum, Panama hats and fruits and vegetables. A tiny park with trees and flowers lies near the dock, and not far away is an old-fashioned fort. Side streets branch off

island-dotted sea. Forty miles to the west the hills of Porto Rico rise hazily in the air, and four miles to the east lies the forest-covered neighboring island of Saint John.

It does not take long to explore Saint John. It is only eight miles long by four miles wide, and its largest settlement, at Cruz Bay, contains fewer than 200 inhabitants. Nearly all of the people on the island are of the black race. This modest islet, however, is the source of over half the bay rum produced in the world; its forests of bay trees are the most extensive of any in the West Indies. Sailing southward from Saint John, we pass a chain of tiny islands, lonely places that are seldom visited, but which are very pretty to look at from a steamer deck.

Then after a voyage of about forty miles, we reach the largest of the Virgin Islands—Saint Croix. It is one of the loveliest gems of the summer seas, and is so green that many call it the "Garden of the West Indies." Before our steamer anchors we can see its great fields of sugar cane, filling up the lowlands and traveling up the hills, while the shining beaches, and the coves with their fringes of palms, give an added touch of beauty.

There are two good-sized towns on Saint Croix—Frederiksted, at the west end of the island, and Christiansted, fifteen miles away at the east end. Frederiksted has a population of 3,000 and Christiansted of about 4,500, but the former town does about four-fifths of the export and import business of the island, because it has the better harbor. Both towns have a clean, well-kept appearance, and the private dwellings, in Spanish-American style, are cool and pretty. To appreciate the beauty of Saint Croix one should journey by motor over its fine roads. An excellent highway leads from Frederiksted to Christiansted, and there are others which follow the coast or wind in and out among the hills.

Saint Kitts, our next stopping place, lying about ninety miles east of Saint Croix, is one of the British Leeward Islands. Across the center of this palm-fringed isle a volcanic range stretches, the highest peak of which, Mount Misery, is nearly 4,000 feet above the sea. The aspect of the island seems far out of keeping with the gloomy name of this slumbering volcano, for wherever one looks the eye meets groves of palm and fields of sugar cane.



A BELLE OF GUADELOUPE

from the main street and make their way up the steep hills. Occasional flights of stairs aid the traveler in his journey up the hills, and we forget the hardships of climbing when we look out over the harbor, town, and

The capital and port of Saint Kitts is a charming town called Basseterre, which lies at the foot of a high, rounded hill. The streets and buildings of the business section are grouped about an open space called the Circus, which is encircled by regal-looking palms. Beyond are the dwelling houses, in a setting of tropical vegetation that is brilliant beyond description. Flowers of countless colors and enchanting fragrance grow in riotous profusion, and the royal palms sway everywhere in the sunny air.

There are excellent roads throughout the island, and carriages and motors in number invite you to explore this beautiful land at your ease. One of the most interesting trips is the ascent of Mount Misery. From Sandy Point, at the northern end of the island, the land gradually slopes upward to the mountain, and the Point is a good starting place. After riding for about eight miles we begin to climb the slopes on foot. Forests of great trees are all about us, and their dense foliage offers welcome shade. We see here specimens of the famous orchids of the tropics, which fasten themselves on the forest trees and obtain nourishment from the air. As we go higher we reach a zone of mountain palms and giant tree ferns, and finally reach the great crater itself.

The cavity is nearly a thousand feet deep, and as the trail goes down its steep sides, we may explore it if we desire. Through the cracks in the crater steam issues, which shows that the volcano is alive, though sleeping, but there has never been an eruption within the memory of man. Before we make the descent from the crater we must refresh ourselves with a look at the entrancing view spread out before us. The distant islands seem like tiny gems set in a sea of rippling sapphire, and the country below is magnificent in its garments of soft green.

Five miles to the south lies Nevis, called the "Gorgeous Isle" in the days when wealthy Europeans journeyed there to enjoy its superb climate and beautiful scenery. Alexander Hamilton was born on Nevis, and the ruins of his home may still be seen. On the same island Lord Nelson and the widow Nisbet were united in marriage, in the year 1787. The days of its glory are all in the past, however, for since the abolition of slavery the island has suffered a great industrial decline. Much of the same condition prevails in the attractive isle of Montserrat, about

forty-five miles to the southeast, but we find a different atmosphere when we reach Guadeloupe, one of the French West Indies.

This island is much larger than all of the American Virgin Islands combined, and is, in reality, two islands separated by a narrow creek. The northern and western portion, called Basseterre, is volcanic and mountainous, while the other part, Grandeterre, is low and fertile. Point-à-Pitre, in Grandeterre, is the port and chief commercial center of the island. Here one sees French West Indian life in all its gayety and animation; the gaudy dress of the natives and their brightly colored houses form a picture that seems quite in keeping with Nature's display of color in this tropical land. The city of Basseterre, on the other side of the island, is the seat of government, and may be reached from Point-à-Pitre by automobile.

Dominica, the largest of the British Leeward Islands, is next in our path. It is a land of superb mountain scenery, and its highest peak—Monte Diablotin—is the loftiest summit in the Lesser Antilles. The inhabitants of Dominica are an unusual people; all but about one hundred of the 30,000 living there are of the black race, but they are thrifty, intelligent and courteous, and many blacks of the wealthy class are university bred. Their loyalty to the mother country was demonstrated during the great war, when they contributed money for the construction of two military aeroplanes. Among the Dominicans there are a few pure-blood Caribs, the original natives of the West Indies.

A score of miles from Dominica is the French island of Martinique, forever memorable as the birthplace of Josephine, wife of Napoleon, and as the scene of the eruption of Mont Pelee (1902). Since the destruction of Saint Pierre, until 1902 the most important town on the island, Fort de France has been the leading city. Fort de France is French in architecture and in atmosphere, and one sees here the same attractive costumes noticed in Guadeloupe. Martinique, like its sister islands, is notable for its verdure, and lovely scenery, and its beauties may be enjoyed by means of motor trips over the splendid roads.

Sailing southward from Martinique for about twenty miles we reach British Saint Lucia, called the "Gibraltar of the West Indies." Castries, the port of the island, lies back of a harbor whose narrow entrance

is well fortified. This place is one of England's great coaling stations, and it is an interesting sight to see the negro girls and women carrying baskets of coal on their heads to the ships. Even with this primitive method, ships can be supplied at the rate of 150 tons an hour.

We are now well on our way to the South American coast. Beyond Saint Lucia lie Barbados, called "Little England" by its people; Saint Vincent, the "cradle of tropical agriculture;" the little islets known as the Grenadines; Grenada, last of the Caribbean islands; and Trinidad, England's largest West Indian possession with the exception of Jamaica.

Trinidad is only six miles east of the coast of Venezuela, whose rugged headlands, as we view them from a distance, seem to blend with the hills and mountains of the island, and form an unbroken line. We slip through a narrow channel and enter the great landlocked Gulf of Paria, anchoring at last off the city of Port of Spain, Trinidad's capital. This city represents modern progress and prosperity, for it is as well built and up-to-date as any town of its size on the American continent. Here we find handsome office and bank buildings, modern, well-stocked stores, wide, clean streets, beautiful parks and attractive dwelling houses, while the waterfront is lined with great docks, railway yards and warehouses. All of the streets are paved with asphalt, as are the splendid roads and highways that thread their way through the island, for Trinidad possesses in Pitch Lake the greatest source of asphalt in the world.

There are any number of interesting trips out of Port of Spain. The journey by rail and steamer to Pitch Lake affords one opportunity to see the industrial development of the island, and all of the famous beauty spots can be reached by railway, automobile or steamer. One of the loveliest bits of scenery is the Maraecas Waterfall, fourteen miles from the city. The water, which has a fall of 350 feet, plunges over a steep wall of rock set in an exquisite background of ferns and flowers. South America, whose shores lie so invitingly near, is easily reached from the island. All of the main ports on the northern coast of the continent have steamship connection with Port of Spain and comfortable traveling is always assured in normal times.

A trip through the Lesser Antilles is one of unceasing interest and pleasure. The islands lie in a region of perpetual summer. They have tropical vegetation unsurpassed in beauty and variety, and scenery as entrancing as any on the globe. In these islands one may see strange customs, meet interesting people, and learn what no book can ever teach.

TRAVERSE CITY, MICH., the county seat of Grand Traverse County, 145 miles north of Grand Rapids, on the west arm of Grand Traverse Bay and on the Pere Marquette, the Grand Rapids & Indiana, the Manistee & Northeastern, and the Traverse City, Leelanau & Northern railroads. It has an attractive situation; there is good fishing in the vicinity, and the city is a summer resort. It is in an agricultural and fruit-growing region, noted for its cherry production. The chief industrial establishment is an oval wooden dish factory. Baskets, farm implements, leather and foundry and machine shop products are also made. A county normal and the Northern Michigan Insane Asylum are located here, and the city has a Carnegie Library and a Federal building. The place was settled about 1850, and was chartered as a city in 1895. It adopted the commission form of government in 1913. Population, 1910, 12,172; in 1917, 14,090 (Federal estimate).

TRAVERTINE, *trav'ur tin*, a white limestone, usually hard and partially crystallized, deposited from the water of springs holding carbonate of lime in solution. Travertine is abundant in different parts of Italy, and many of the finest buildings of ancient and modern Rome are built of this stone.

TRAWLING, a mode of deep-sea fishing. The trawl is a triangular purse-shaped net about seventy feet long, which is dragged along the bottom of the sea. The mouth of the net, about forty feet wide, is kept open by a wooden beam. Trawling is possible only on a smooth, sandy ocean floor, as a rough sea bed would destroy the nets. Vessels specially built for this kind of fishing are called trawlers. Trawling is not allowed near the shore. Cod, whiting and other whitefish are taken in large numbers by trawling, and some kinds of flatfish, as soles, can scarcely be caught in any other way. See FISHERIES.

TREADMILL, *tred'mill*, a device formerly used in European prisons by convicts sentenced to hard labor. It consisted of a cylin-

der with steps around its circumference on which the operator was placed. The weight of the body set the apparatus in revolution, and to maintain a footing the operator was forced to keep up a running gait, while his body remained stationary, keeping in balance by means of a handrail. An endless band attached to machinery conveyed the power it produced. The exercise was severe and with the development of the more humane penology, the last of the treadmills was abolished early in the twentieth century. Another form of treadmill has been used to operate farm machinery, the power being supplied by horses, dogs or other animals.

TREASON, *tre'z'n*, that crime which is directly committed against the supreme authority of the state, everywhere considered the most heinous of crimes. In a monarchy it is the betraying or the forfeiting of allegiance to the monarch. In a republic, such as the United States, where the people as a community, and not any one individual are sovereign, treason is necessarily confined to levying war against the state, or adhering to and giving aid and comfort to the enemy. The classic example of treason in United States history is the case of Benedict Arnold (which see).

TREASURY DEPARTMENT, the department of the United States government which has control of all the national revenues and expenditures, was established in 1846 under the name of the *Independent Treasury*. It is the most complex and extensive of all the departments of government, and ranks next to the Department of State. As first established the department consisted of the Secretary of the Treasury, a comptroller, an auditor, a treasurer, a register, an assistant secretary and a clerical force. From this small beginning the department has expanded until it now includes branches in all the principal cities, and has over 5,000 employes in its service at Washington and many others in the various branches.

The Treasury Department collects all taxes levied by Congress, including income taxes, duties on imports and internal revenue taxes. It has charge of the minting of all coins and the printing of all paper money, postage stamps and other stamps issued by the government, and of all bonds and other certificates of indebtedness. It disburses all moneys collected, according to appropriations made by Congress. It has oversight

over all National and Federal reserve banks, and protects the people against counterfeiters and smugglers. It also has charge of the construction and maintenance of all United States government buildings in the country, and the general control and auditing of the accounts of the other executive departments.

Secretary of the Treasury. The Secretary of the Treasury is the chief officer of the department. He is a member of the President's Cabinet and is next to the Secretary of State in line of succession to the Presidency. His salary is \$12,000 a year. Many of the most noted men in American history have filled the position of Secretary of the Treasury, among them Alexander Hamilton, Albert Gallatin, Alexander J. Dallas, William H. Crawford, Roger B. Taney, Salmon P. Chase and John Sherman.



The Secretary is aided by three assistant secretaries, but the chief officer next to the Secretary is the *Comptroller of the Currency*, who has general supervision over the auditors and countersigns all orders for the payment of money. No money can be paid out of the Treasury without his approval. The Comptroller is assisted by six auditors, who are assigned respectively to the other executive departments. The *Treasurer of the United States* is responsible for the care and disbursement of all the money belonging to the United States, and he signs all paper money issued by the government. The *Director of the Mint* has charge of the coining of money in the various mints, and the *Commissioner of Internal Revenue* has charge of the collection of all revenue fees, including income taxes.

TREATY, *tree'ty*, an agreement, league or contract between two or more nations or sovereigns, formally signed by commissioners properly authorized, and ratified by the several sovereigns, or the supreme power of each State. Treaties are of various kinds, as *commercial treaties*, *treaties of alliance*, offensive and defensive, and *treaties of peace*. In most monarchies the power of making and ratifying treaties is vested in the sovereign; in the United States it is vested in the President and the Senate, the former conducting the negotiations, the latter ratifying the completed treaty.

TREATY OF VERSAILLES. See VERSAILLES, TREATY OF.

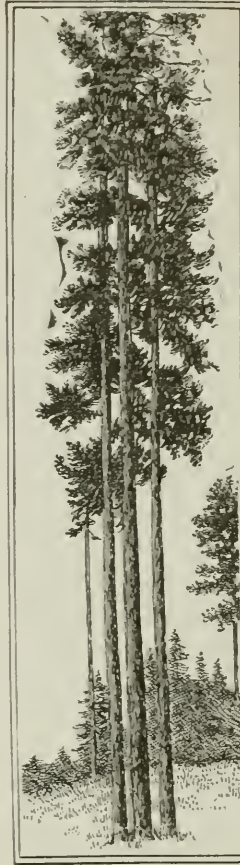
TREBIZOND, TURKEY, situated on the Black Sea, 575 miles east of Constantinople.

The city occupies a plateau and is enclosed by walls erected during the Middle Ages. It contains a number of ruins of ancient structures, among them those of an old castle and several old Greek churches, which have been transformed into mosques. In general, the dwellings are low, one-story buildings. The city contains numerous bazaars and is the seat of an extensive commerce, though the harbor is poor. Population, about 55,000.

TREBLE, in music, the highest vocal or instrumental part in a harmonized musical composition, sung by women or boys or played by instruments of acute tone, as the violin, the flute, the oboe or the clarinet, or on the higher keys of the piano or organ. The *treble clef*  is a sign used at the beginning of  written music to indicate the treble staff. See **MUSIC**.

TREE, the common name of one of the most important groups of plants. "Next to the earth itself," writes Gifford Pinchot, "the forest is the most useful servant of man. Not only does it sustain and beautify the land, but it also supplies wood, the most widely used of all materials. Its uses are numberless and the demands which are made upon it by mankind are numberless also." Trees have certain characteristics that separate them from other kinds of plants. Unlike herbs, they develop a hard, woody tissue, and instead of dying at the end of the growing season, as is true of many herbs, they live on indefinitely from year to year. Trees differ from shrubs, which grow as vines or bushes, in that the tree stem emerges from the soil a single structure. Branches never are borne close to the ground, as in case of shrubs. Trees are also distinguished from shrubs and herbs in size. In general, trees vary in height from twenty-five to 300 or 400 feet. There are, however, certain trees under twenty-five feet, especially among the fruits. These are called *dwarfs*, and their undersize is usually the result of pruning.

Parts of a Tree. Trees grow from extended root systems. The roots are found deep in the earth, and they spread out over a large area, in case of large trees, for they not only must gather food from the soil, but must be strong enough to serve as a sure foundation. The woody stem, or part that grows above the soil, is called the *trunk*, or *bole*. There are two classes of boles, represented by those of the pine and the elm. The former tree sends



THE TREE

BY JOYCE KILMER

Who Gave His Life in
the World War

I think that I shall never see
A poem lovely as a tree.

A tree whose hungry mouth
is pressed
Against the earth's sweet
flowing breast.

A tree that looks at God all
day
And lifts her leafy arms to
pray;

A tree that may in summer
wear
A nest of robins in her hair;

Upon whose bosom snow has
lain;
Who intimately lives with
rain

Poems are made by fools
like me,
But only God can make a
tree.



up a tall, undivided trunk; the latter has a bole which divides into branches. These types are illustrated in the section *Winter Study of Trees*, below (see Fig. 1 and Fig. 2). The upper part of the tree, that including branches and foliage, is called the *crown*.

Lessons on Trees.

Notwithstanding the value and usefulness of the forests, people have been exceedingly prodigal of them, and millions of acres of forests which should have been preserved for future generations have been ruthlessly destroyed. All too late they are beginning to realize the damage done, and both state and national governments are taking strenuous measures to protect the forests that remain, and to secure reforestation of some of the regions from which the forests have been removed. The school can and should do much toward assisting this movement in each locality.

General Suggestions. 1. Thousands of young trees are destroyed every year through

thoughtlessness. Children as well as adults engage in this destruction. Attention, therefore, should frequently be called to the importance of preserving and caring for these trees.

2. Success in securing the children's interest in caring for trees will depend upon the teacher's ability to secure the interest of each child in some particular tree. A good way to do this is to ask each pupil old enough to engage in the work at the beginning of the fall term to select a tree which he may call his tree for the year. The tree chosen may be in the schoolyard, by the roadside, near the child's home or in any other place where it can be frequently seen.

3. From the study of this particular tree lead each child to study trees in general. The first lessons in the fall should have this end in view.

4. Observations upon which the study of trees may be based require time. It is not wise to give lessons upon this subject daily. Usually one lesson a week is all that should

Fall Study of Trees. *Preparations for Winter.* In the study of natural objects it is wise to begin with the study of conditions that prevail at the time that the lessons are given. This is particularly necessary in the study of trees.

Call attention to the autumn tints as they gradually appear.

Ask the children to collect and bring to school leaves of different colors. How many different kinds of trees are represented in the collection?

Do all leaves from the same sort of trees have the same color or varying shades of that color?

What is the prevailing color of the leaves of the oak? Of the maple? Of the beech? Of the sumac?

Can you tell the sorts of trees in a forest by the color of the leaves in the autumn?

If the trees to which attention is called in the above paragraph are not common to the locality, those that are common should be selected and they will answer equally well.



FIGURE 1

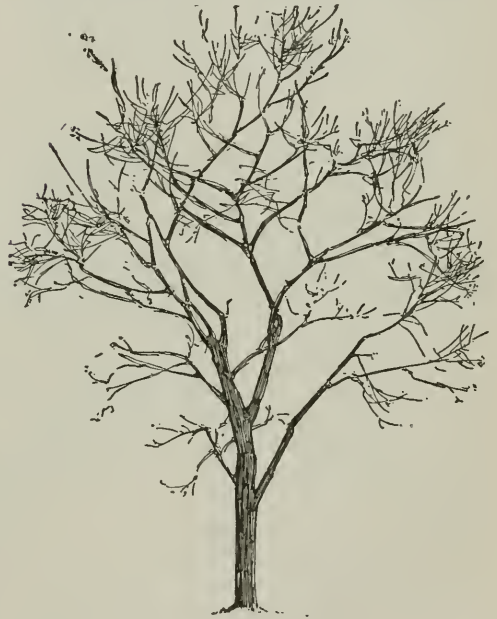


FIGURE 2

be attempted. More may be given if the time at the teacher's disposal and the ability of the class warrant, but in all cases the pupils should be given opportunity to prove by their own observations the facts discussed in the lesson.

The answers to the last question cannot be given offhand, but by frequent observation the children will be able in time to judge quite accurately the prevailing species of trees in any woods from the general appearance of the leaves in autumn.

Some Causes and Effects. Another question which will require thought is: Why do the leaves change color, wither and fall? Of course, only the older pupils can pursue this line of thought very far, and it may be well to let it stand before the class through the entire season, as they follow the putting forth of the leaves and blossoms and the developing and ripening of the fruit.

Do all trees shed their leaves in winter?

What trees in your locality do not?

Discussion of these facts will enable you to divide the trees into those which shed their leaves, or deciduous trees, and those which do not shed their leaves, or non-deciduous or evergreen trees. It will be interesting to have the class compare the kinds of leaves from the two classes of trees.

Of what advantage is it to the deciduous trees not to have leaves in winter?

Winter Study of Trees. Several lessons can be devoted to plans of branching. When the trees are free from leaves these plans can be easily seen. Two general plans of branching are found; one, in which the trunk extends through the crown to the highest point in the tree, as in Figure 1. The pine and the beech are familiar examples of trees having this plan of branching.

The second plan is seen when the trunk divides into a number of large branches, from each of which other branches extend, as shown in Figure 2. The elm and the apple are good illustrations. Spend one or two lessons in discussing the relation of these plans of branching to the shape of the tree.

What shaped crowns do the evergreens have?

What shaped crown does the elm have?

The Arrangement of Buds and Branches. Ask the children to study the arrangement of branches on the evergreens. A pine, spruce or balsam will answer the purpose. They will discover that the branches are arranged around the trunk in whorls.

What does this arrangement have to do with the shape of the tree?

Have the pupils bring to school small branches from the elm, the maple, the apple tree and cottonwood. Other trees common in the locality will answer as well. Perform the following experiment with the branch from each tree. Stick a pin in the bud near the lowest end of the branch. Fasten a white thread to this pin, extend this thread to the next bud, then to the next, and so on, winding

it around the branch as may be necessary to reach each successive bud. Continue until a bud practically over the first is reached.

How many buds were passed?

How many times did you wind the string around the branch?

The answers to these questions will vary with the different branches, and the experiments will reveal the following facts: first, that on some trees the branches appear opposite each other; secondly, that on most trees the branches appear on alternate sides of the stem; thirdly, that this alternate arrangement varies in different species of trees.

Study of Structure of Buds. The same branches may be used for this purpose. If placed in water for a few days, in a warm room, the buds will swell and their parts can be easily seen.

What is the purpose of the scales and of the gumlike substance found on some buds?

If possible, procure some buds from the horse chestnut. What is the purpose of the cottonlike substance in these buds?

Study of the Bark and Wood: Have some pupil procure a section of the branch at least one inch in diameter. A large branch is better. The section should be at least six inches long. First study its external appearance.

What is the color of the bark?

Examine the end of the branch. From this, how many layers of bark can you discover?

How are the layers of wood arranged?

What is the dark portion in the center?

Split the branch through the center. Smooth the surfaces with a plane or sharp knife. From the study of these surfaces, how many layers of bark do you discover?

If you have an opportunity to secure a section of the trunk of a tree, six inches or more in diameter, you can teach the pupils to pursue their studies still further. Saw one end of the section off with a fine saw, then smooth the surface with a draw knife or plane. When this is done, ask the pupils to note and count the rings or layers of wood, showing that each layer represents a year's growth. How old is the tree? Split the section through the center and smooth

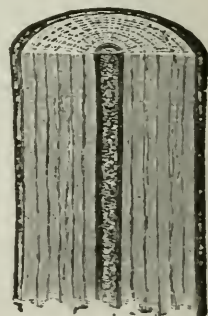


FIG. 3
SECTION OF A
BRANCH

and examine the surface of one piece. Can the annual growth be traced on this surface? These sections make very fine cabinet specimens, and where they can be obtained without destroying the tree for the purpose may



FIGURE 4

be preferred to the specimens which are described a little later in this article.

How many kinds of wood are there in the branch?

How do these kinds of wood compare with each other in color?

Following these exercises, ask the children how many trees they know by the appear-

diameter and may be cut in the form shown in Figure 3, or one end may be slanting. The specimens should be sound and thoroughly dried, and then the exposed surfaces should be smoothed and oiled or varnished, so as to bring out the coloring and graining of the wood. In the spring and summer leaves of these trees may be pressed and the flowers and fruit gathered and mounted. If these are placed on stiff cardboard the card can be put in the cabinet back of the specimen showing the kind of wood. Thus there is a complete exhibit of each tree in the locality.

Spring and Summer Studies. *Early Blossoms and Fruit.* Ask the class to watch the trees in the spring and notice which ones put forth their blossoms before the leaves appear. Samples of these different blossoms should be gathered and brought to class for study. Blossoms are small and it is not wise to attempt to study their different parts at this time. The chief thing is to notice the different forms. Good trees and shrubs to compare are the soft, or red, maple and the willow, as the two typical forms of blossoms are produced by these trees. Ask the pupils to follow the



FIGURE 5

ance of the bark. It is well for each to make a list of the trees he can recognize in this way.

A very pleasant and valuable exercise connected with the study of trees is the beginning of a school cabinet of native woods. The specimens should be at least four inches in

development of the seeds on these trees and to notice also the way in which the seeds are scattered.

How soon do the maple seeds germinate?
Study of Leaves. Ask the class to observe what trees put forth their leaves first.

Which ones put forth their leaves next?

Which are the last?

When the leaves are fully developed, ask the children to bring leaves from the elm, maple and oak. Compare these in size, form and structure. This comparison will show that leaves of deciduous trees are constructed on two general plans: first, the plan having one large rib known as the midrib and seemingly the extension of the leaf stalk, extending through the leaf from the base to the apex, as illustrated in Figure 4, which shows the leaf and blossom of the elm. The second plan shows several large veins or ribs radiating from the end of the leaf stalk, as shown in Figure 5, which is an illustration of the maple leaf. After these plans have been studied, pupils should be asked to find as many different trees and shrubs as they can, having these different sorts of leaves. They will discover in their search that the shape of the leaf in all cases depends upon its plan of veining, or the arrangement of the large veins or ribs.

Some trees do not produce their fruit early in the season. This is particularly true of those that bear nuts, such as the oak, beech and hickory. Children should be encouraged to watch these develop through the summer and to gather specimens of fruit as soon as they are ripe. These specimens will furnish material for lessons next fall.

Planting Trees. The great purpose of lessons on trees should be to secure such an interest in them on the part of the children that they will want to care for those about the school and their homes, and that they will also want to increase the number by planting others. This may be done in one of two ways: first, by planting the seeds of the trees; second, by transplanting the trees taken from localities where they are not needed.

The children will be greatly interested in planting seeds of trees, such as the seed of the maple. If there is a school garden a small section may be set apart for this purpose. The soil should be made mellow to the depth of twelve to fourteen inches and the seeds placed in it with only a slight covering of earth, the general rule being to make the covering equal in depth to the diameter of the seed. If these seeds cannot be planted in the school grounds they can be planted in flower pots or boxes. After planting, the soil should be thoroughly wet and be kept reasonably moist until the seeds germinate. It is interesting to care for these young plants

through the season and notice how fast they grow. If carefully protected from injury, the second year they will grow still more rapidly and in a short time become large enough to transplant. Children who watch the growth of trees from the seed in this way become acquainted with their appearance and from this knowledge are able to protect thousands of young trees which are destroyed through ignorance.

Teachers should thoroughly understand transplanting of trees and be able to give practical lessons on it. This can usually be done most successfully by directing the pupils in planting one or more trees in the schoolyard. Most arbor day manuals contain specific directions for this work. However, the following points, taken from "Farmers' Bulletin No. 134, United States Department of Agriculture," are so plain and practical that they are here reproduced for the benefit of those who wish more extended directions than are usually found in the manuals. This bulletin is excellent authority and those who carefully follow directions here given may feel sure of success.

How to Plant Trees

Preparation of the Soil. Thorough preparation of the soil should precede the planting. Where blocks or belts are to be formed, the ground should be plowed and prepared as for a garden crop. Clay soils are best plowed the previous fall, in order that the ground may weather over winter. On such soil subsoiling is beneficial, and should precede the planting by at least one season. Just before planting time the ground should be pulverized with a roller or harrow. If the planting is to be done in rows, the ground should be marked off lengthwise and crosswise and the trees set at the intersections. It is sometimes desirable to mark off the ground only one way and run furrows the other. In arid regions the furrows may be deepened into trenches, so that rain water which falls on the surrounding ground may be drained to the tree. On the other hand, in regions having a copious rainfall it will frequently be necessary to plant the trees on a raised portion or mound of earth in order to keep the soil dry enough for them to thrive. The holes should be dug large enough to contain all the roots fully spread out, and deep enough to allow the tree to stand about three inches lower than it grew as a seedling. It then should flourish.

Time and Manner of Planting. South of the thirty-seventh parallel, fall planting is safe and often advantageous. North of this, spring planting should be the rule, as fall-planted trees can scarcely develop sufficient roots to sustain themselves during the winter. The most successful nurserymen practice early planting for deciduous trees, beginning operations as soon as the ground ceases freezing. Evergreens are not planted until later; some even wait until the young growth is starting. If possible, planting should be done on a cool, cloudy day. Unless the day is very moist, the trees should be carried to the planting site in a barrel half filled with water, or a thin mixture of earth and water, and lifted out only as they are wanted. Even a minute's exposure to dry air will injure the delicate roots—the feeders of the tree.

The roots should be extended in their natural positions and carefully packed in fine loam soil. It is a good practice to work the soil about each root separately and pack it solid with the foot. As the hole is filled, the earth should be compacted above the roots and around the stem, in order to hold the tree firmly in place. The last two inches of soil should be very fine, and should lie perfectly loose. It will serve as a mulch to retain the moisture.

Trees should be planted neither in very wet nor in very dry soil. If the soil is wet, it is better to wait until it is drier. On the other hand, if good cultivation has been maintained the year previous to planting, the soil is not likely to be so dry that trees will not start. Besides insuring a supply of moisture, such cultivation puts the ground in good physical condition for planting.

With this treatment, watering will scarcely ever be necessary. If it is, the holes may be dug a few days beforehand and filled with water. They should be refilled as the water soaks away until the soil is fully moistened. A thorough irrigation, when that is possible, is still better. As soon as the soil becomes somewhat dry the trees should be planted. While it is a common custom to water at the time of planting, those who do no watering are usually the most successful. Even in the semi-arid regions some successful growers apply no water, but keep up an excellent system of cultivation, thereby retaining the soil moisture.

The spacing of the trees is not so important in school-ground planting as in forest

plantations, yet it is worth consideration. The trees should not stand so near together as to produce long, slender poles; on the contrary, short, thick trunks are desirable, to support large tops and withstand heavy winds. From 8 to 12 feet apart will be suitable spacing distance. Where large blocks are to be planted the trees may be closer, but it is scarcely ever desirable to plant them closer than 6 by 6 feet.

Why Trees Die in Transplanting. To many persons it is a mystery why trees die after being transplanted. They do not die without cause, however, and when one begins to wither something is wrong. Oftentimes the result is not to be noticed until weeks after the injury; in other cases it is apparent in a few days. After the injury has been done it can be overcome only by the subsequent growth of the tree. All the assistance that can be given is to make the surroundings of the tree favorable for growth. The following are some of the causes of death among transplanted trees:

Loss of Roots. The loss of the principal part of its root system when the tree is being taken up is a great shock to its vitality, and frequently causes its death. A very large part of the roots must be cut off, for usually the space surrounding the tree is filled with fibrous rootlets, myriads of which can scarcely be detected with the naked eye. Almost all of these are lost, as well as many of the larger roots. Mr. D. C. Burson, of Topeka, Kan., last year dug up and measured as much as he could of the root system of a vigorous Hardy Catalpa seedling that had grown from May till November. This six-months-old seedling showed over 250 feet of root growth. By the methods in common use only a fifth, or perhaps as little as a tenth, of the root is taken up with the tree in transplanting. Such loss throws the root out of balance with the top. If the top is not shortened, or in some way protected, the leaves may evaporate more moisture than the roots can provide, resulting in the death of the tree.

Exposure Before Planting. With proper subsequent treatment a tree can endure the loss of many roots, but instead of the needed protection it often gets much unnecessary exposure to sun and dry air. This may be in digging, packing, shipping, unpacking, or any other of the various handlings which it undergoes between its removal from the ground and subsequent planting. On a warm

day in March the writer saw a bundle of trees in shipment across the plains of Texas without the slightest covering. Before the destination was reached the roots became withered and almost dry, having suffered a hundred times more exposure than the ordinary tree can stand without injury. Not many persons would be guilty of such gross neglect, but the fact remains that exposure causes the death of more trees in transplanting than any other single cause. Exposure can usually be easily prevented, and no one who persists in neglectful practices can hope to be successful.

Failure to Plant Well. The failure to pack the soil tightly about the roots is a common error in planting. It causes injury in two ways: It leaves the tree unstable, to be rocked to and fro or even blown down by the wind; it also prevents the first growth of rootlets from absorbing food. This they cannot do unless good, fine soil is firmly packed around them. Clods will not pack snugly. Likewise manure or litter of any kind mixed with the soil may prevent firm packing. Anything that prevents the soil particles from coming into close contact with the roots is sure to be injurious. Another error is in shallow planting. This allows wind and water to lay bare the roots, and in a short time the tree dies. Crowding the roots into too small a hole is a similar difficulty. Such errors are more often due to lack of experience and skill than to haste. The unskilful planter will hardly plant well, however slowly he may go.

Wet Soil. Trees are often injured by being planted in wet soil. Whether the excessive moisture is a permanent or a temporary condition is likely to make little difference in the results. If it is permanent the water prevents the air from reaching the roots, while if it is only temporary the trampling of the soil over them causes it to stick together so that on drying it becomes baked, leaving them impacted in a hard lump of earth which excludes the air. Excessive air currents in the soil cause injury by drying the roots, but a constant permeation of the soil by the air is necessary to supply oxygen. This process is precluded by either the saturation or the baking of the soil. Undrained pockets occur here and there even in well-drained fields, and are always difficult to deal with in tree growing. Careful investigation before planting is very desirable.

When We Plant a Tree

HENRY ABBEY

What do we plant when we plant the tree?

We plant the ship which will cross the sea;

We plant the mast to carry the sails;
We plant the plank to withstand the gales,

The keel, the keelson, the beam, the knee:

We plant the ship when we plant the tree.

What do we plant when we plant the tree?

We plant the houses for you and me;
We plant the rafters, the shingles, the floors;

We plant the studding, the lath, the doors,

The beams, the siding, all parts that be:
We plant the house when we plant the tree.

What do we plant when we plant the tree?

A thousand things that we daily see;
We plant the spire that out-towers the crag;

We plant the staff for our country's flag;

We plant the shade from the hot sun free—

We plant all these when we plant the tree.

Drying Out of the Soil. Another cause of death is the drying out of the soil. Summer droughts are not unknown in any part of the country, and are very frequent in parts of the Mississippi Valley and on the Plains. Occasionally they are so intense and long continued that it is difficult to make recent transplanted trees survive, even when carefully planted and cultivated. In such a time, those which are poorly planted and cultivated are almost sure to die. Frequently, too, weeds and grass grow up in the plantation and draw off the moisture, thereby greatly diminishing the supply for the young trees.

On a school ground there is likelihood of the trees being injured by the trampling of the soil. The pupils will naturally wish

to play among them, and unless they are restrained the soil will soon become compacted. It then dries out very quickly, and in time of drought the trees are sure to suffer and may be killed. By proper care and kindly suggestion, the children can be persuaded to help the tree in its struggle for life by keeping away from it until it is well rooted.

Related Articles: Consult the following titles for additional information:

Acacia	Juniper
Alder	Laburnum
Arbor Vitae	Larch
Ash	Laurel
Aspen	Leaves
Banyan	Locust
Basswood	Lumber
Bay	Magnolia
Beech	Mango
Birch	Mangrove
Bitternut	Maple
Black Gum	Mountain Ash
Bottle-Tree	Nettle Tree
Box Tree	Nut (with list)
Buckthorn	Oak
Cabbage Palm	Olive
Cacao	Osage Orange
Catalpa	Palm
Cedar	Palmetto
Chestnut	Palmyra Palm
Coniferae	Pine
Cottonwood	Poplar
Cypress	Roots
Date	Sago
Deciduous Trees	Seeds
Doum Palm	Sequoia
Elder	Sorrel Tree
Elm	Spruce
Eucalyptus	Stems
Evergreen	Sycamore
Fruit (with list)	Tallow Tree
Hemlock	Tamarind
Hickory	Teak
Horse-Chestnut	Tulip Tree
Ironwood	Upas
Ivory Palm	Willow
Judas Tree	Yew

TREE, HERBERT BEERBOHM, SIR (1853-1917), an English actor and manager, born in London and educated in England and Germany. He made his first appearance on the stage as Grimaldi, at the Globe Theatre, in 1878, and six years later achieved a great success as the Curate in *The Private Secretary*, given at the Prince's. In 1887 he undertook the management of the Comedy Theatre and of the Haymarket. He visited the United States in 1894. His repertoire included *The Merry Wives of Windsor*, *The Pompadour*, *The Dancing Girl*, *Hamlet*, *Trilby* and *John-a-Dreams*. He published *Fallacies of the Modern Stage* and *The Imaginative Faculty*.

TREE FROG, or TREE TOAD, which, as the name indicates, lives among the branches of trees, is a link between toads and typical frogs. It has claw-shaped toes, and a further aid to climbing is provided by nature in the flat, sticky cushions on the feet which adhere to smooth surfaces. They are small, shapely, active and of changeable color, and their

notes are loud and piping. They should never be harmed, as they are destroyers of insects.

TREFOIL, a genus of plants belonging to the bean family. There are numerous species, all having compound leaves in three divisions, like clover. Bird's-foot trefoil, so called because the pod clusters somewhat resemble a bird's foot, is a plant similar to the Irish shamrock. It grows on the European continent and in the southern part of the United States. The name trefoil is also applied to a small three-part architectural ornament.

TRENT, a river of England, which rises on the northwest border of Staffordshire, flows southeast to Derbyshire, then northeast through Derby, Nottingham and Lincoln, joining the Ouse about fifteen miles west of Hull. The two streams unite to form the Humber. The Derwent, Idle, and Tarn and Soar are its tributaries. The Trent is 170 miles long and is navigable for barges 120 miles. It is connected by canal with the Mersey. Next to the Severn and the Thames, the Trent is the most important river in England.

TRENT, COUNCIL OF, a celebrated ecumenical council of the Roman Catholic Church, convened to settle various controversies that were agitating the Church during the Reformation period and to correct abuses. The Council was called by Pope Paul III, in December, 1545, at Trent, a town in the Austrian Tyrol. The sittings were interrupted by political and religious disturbances, and the work undertaken was not finished until 1563. So thorough were the labors of the Council that the standard of Roman Catholic faith and practice which it set has not been altered to the present day. The only additions have been the statements regarding the Papal Infallibility and the Immaculate Conception.

TRENT AFFAIR, an incident of the American Civil War, important historically as it involved the question of the right of search. In October, 1861, Captain Charles Wilkes, in command of the United States ship *San Jacinto*, intercepted at sea the British mail ship *Trent* and took from it two Confederate commissioners, John Slidell and James M. Mason, who had embarked from Havana and were on their way to France and England to solicit aid for the Confederate cause. The commissioners were

taken to Fort Warren, Boston. The act, though applauded by the North, was in violation of international usage. The *San Jacinto* should have taken the *Trent* as a prize to a port, to be adjudged. President Lincoln and Secretary Seward recognized the impropriety of the act and released the prisoners, with apology to the British government. See MASON, JAMES MURRAY; SLIDELL, JOHN.

TRENT CANAL. See CANALS OF CANADA.

TRENT-ET-QUARANTE, *trahNt ay kahrahNt'*, or **TRENTE-UN**. See ROUGE-ET-NOIR.

TRENTON, N. J., the capital city of the state and the shire-town of Mercer County, situated on the Delaware River, at the head of navigation, on the Delaware, and Raritan Canal and on the Pennsylvania, the Baltimore & Ohio, the Delaware, Lackawanna & Western and the Philadelphia & Reading railroads. It is also connected by electric lines with New York, Philadelphia and the principal cities of New Jersey. It is noted for its immense pottery works, for it manufactures more than one-half of all the pottery and china produced in the United States, and for extensive iron works and wire mills. There are also rubber works, furniture factories, watch factories, carriage and wagon works and brick and tile yards.

The city possesses exceptional educational advantages, having the state normal and model school, a school of industrial arts and numerous private and religious academies and business colleges. It has a beautiful public library building containing about 75,000 volumes, and the state library. It is the seat of the state asylum for the insane, the state reformatory, a reformatory home for girls and the state penitentiary. Other conspicuous buildings are the state capitol, the county courthouse, the state armory, the Federal building, the Y. M. C. A. building, the Masonic Temple and the high school building. Cadwallader Park and Spring Lake Park contain many beautiful monuments and drives. Trenton was the scene of a notable engagement in the Revolutionary War (see TRENTON, BATTLE OF). It was first settled in 1676, was incorporated as a borough in 1746, and was made the state capital in 1792. It adopted the commission form of government in 1911. Population, 1910, 96,815; in 1917, 113,974 (Federal estimate).

TRENTON, BATTLE OF, an important battle of the Revolutionary War, fought at Trenton, N. J., the night of December 25, 1776, about a month after Washington had begun his retreat across New Jersey. Pursued by the British, he crossed the swollen Delaware River, on which were floating blocks of ice, on December 8th. Cornwallis then took up his position at Princeton. On the night of the twenty-fifth Washington recrossed the Delaware, marched on Trenton, which was defended by a force of Hessians, surprised them in the midst of their Christmas night carousal, and captured about a thousand. The Americans lost five men—two killed, three wounded. Washington immediately recrossed the river, and soon afterwards fought the famous Battle of Princeton. These successes revived the spirits of Washington's army and practically turned the tide of victory toward the Americans. See PRINCETON, BATTLE OF.

TRENTON, ONT., in Hastings County, at the mouth of the Trent River near the west end of the Bay of the Quinte, 100 miles east of Toronto, with which it has boat connection. It is on the Grand Trunk, the Canadian Northern and the Canadian Pacific railways. Its industries include a foundry, cannery, a silverware factory, grist mill, clothing and button factories, paper mills and canneries. The town is near iron mines and limestone quarries. Population, 1916, about 9,000.

TRENTON SERIES, an extensive rock formation, forming part of the Ordovician System. The rocks, mainly limestones and carbonaceous shales, are named for Trenton Falls, Central New York, where the largest typical deposits occur. Other localities where they are conspicuous are along the eastern, southern and western borders of the Adirondacks, on the northern shores of Lake Ontario, in the upper Mississippi Valley and in the Rocky Mountains. In Wisconsin and Illinois Trenton rocks contain zinc and lead ores; in Indiana and Ohio they are a source of oil and natural gas. The limestones of this formation are much used for building material and for making lime and Portland cement.

TREPANG', the commercial name for several sea slugs which are an important article of food among the Chinese. The slugs are found chiefly about coral reefs in the Eastern seas, particularly in the Indian Ocean,

in the Eastern Archipelago and on the shores of Australia. The trepang is a repulsive looking animal, with a soft, wormlike body, varying in length from six to twenty-four inches. It is smoked and dried for the market, and is used chiefly to make soups. There is a small trepang industry in California.

TREPHING, *tre fine' ing*, the operation of cutting a circular opening into the skull, by means of a *trepphine*. The operation is made necessary by skull fracture or other injury requiring removal of a particle of bone. It is done with an instrument consisting of a small hollow steel cylinder from half an inch to an inch in diameter, with teeth on its lower edge forming a circular saw. See SURGERY.

TRES'PASS, an offense against the person or property of another, especially an unlawful entry upon property. Injuries committed against land or buildings, as posting advertisements without permission, entering another's house or allowing cattle to stray into his fields, are common forms of trespass. The entry of an officer of the law without the authority of a warrant is a trespass. Redress for trespass is obtained through a suit for damages. A trespass committed by mistake is as actionable as wilful trespass. Continued or threatened trespass may be restrained by injunction.

TRIAL BY BATTLE. See BATTLE, TRIAL BY.

TRIANGLE, a plane figure bounded by three straight lines. Triangles are classified as *equilateral*, *isosceles* and *scalene*, according as they have three sides, two sides or no sides equal. They may be *obtuse*, *acute* or *right-angled*. The side upon which a triangle rests is its *base*; the point of the angle opposite the base is the *vertex*; the distance between the base and the vertex is the *altitude*. In a right triangle the side opposite the right angle is the *hypotenuse*.

It has been known since 500 B. C. that the square on the hypotenuse of a right triangle is equal to the sum of the squares on the other two sides. From this fact any side of a right-angled triangle may be found, if the other two sides are known. The area of a triangle is calculated by multiplying the base by the altitude and dividing by two.

TRIAS'SIC SYSTEM, a group of rocks, extending from the Carboniferous System, below, to the Jurassic, above. It is therefore the oldest formation of the Mesozoic

Era. The rocks are sedimentary, but in many places they are disarranged by the breaking through of volcanic matter, which has formed dikes and cliffs of trap. The Palisades of the Hudson afford a good illustration of such formations. Triassic rocks are generally distributed throughout all continents. In North America they are found on both the Atlantic and Pacific coasts. The sandstone of the Connecticut valley and of New Jersey, so highly prized for building, is of this period; most of the other sandstones of the formation are red and form the group sometimes classified as New Red Sandstone. The plant life was similar to that of the Carboniferous Period. The large quantities of fossils found in the rocks show plainly that vast numbers of gigantic lizard-like animals overran the land and that the seas teemed with other monsters of huge size. The period is often referred to as the Age of Reptiles.

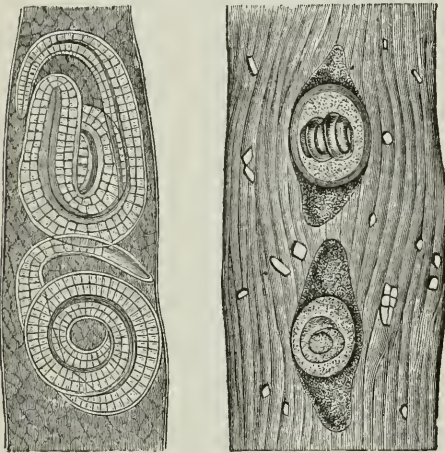
Related Articles. Consult the following titles for additional information:
Carboniferous System Mesozoic Era
Jurassic System New Red Sandstone

TRIB'UNE, from the Latin *tribunus*, in ancient Rome was the name applied to either of two government officials, whose duties were totally different. Originally the tribunes were the commanders of the soldiers furnished to the Roman army by the tribes, and from this the title is doubtless derived. In the time of the Republic the *military tribunes* ranked next to the commander in chief. Under the Empire the office was of less importance.

Far more important than the military tribunes were the *tribunes of the people*. These were magistrates elected to protect the people's rights. The office was instituted in 494 B. C. The tribunes had almost dictatorial powers and in the later years of the Republic they were the leading officers of the state.

TRICHINA, *tre ki' na*, a minute worm, which, when it obtains lodgment in the muscles of man, gives rise to the disease trichiniasis. The worm is found in several of the mammals, especially the pig, and it is generally from the latter that man receives the disease. When flesh containing the larvae, or worms in their resting stage, is taken into the stomach, these soon become developed into adult worms, which pass into the intestines. In the mature state the male is about one-twentieth of an inch long, and the

female is from one-eighth to one-twelfth of an inch in length. The female produces an extraordinary number of embryos, which, by penetrating the mucous coat of the intestine, enter the capillaries and are carried thence into the general circulation; thence they make their way into the muscles, where they rest encased in a limy cyst and give no further trouble. While in their active state, they set up diseased conditions in their host, which often prove fatal. In the illustration, the figure to the right shows larval worms in the encysted state, embedded in the human muscle, and the figure to the left shows trichinae free in the human muscle.



TRICHINAE
Encased and free.

Trichiniasis. This is the disease caused by the passage of the trichina from the intestines to the muscles. The first symptoms of the disease are loss of appetite, nausea, weakness and diarrhoea. These are followed by pains in the muscles, fever and swelling of the limbs, and sometimes by stiffening of the joints. The disease runs its course in about four weeks. From ten to thirty per cent of the cases are fatal.

No means is known of destroying the parasites after they have reached the muscles, but if, as soon as infection is suspected, castor oil or calomel is given in quantities, the embryos will be expelled from the intestines, and health will return. As a general preventive measure, no pork should be eaten by any one, unless it has been thoroughly cooked. Smoking, as in the treatment of hams, is not sufficient to kill trichinae. The real cause of the disease was first made known about 1860, though cases of it had been known in Europe

since the beginning of the century. It has appeared in the United States and in most parts of Europe, occasionally as an epidemic.

TRICOLOR, the French national flag, or one formed after the model of it. The French tricolor is blue, white and red, in equal vertical sections, the blue being next the flagstaff.

TRICYCLE, *tri'sik'l*, a three-wheeled vehicle propelled by the hands or feet. It is adapted to several uses, being made to serve as a child's plaything or as a means of locomotion for those who cannot walk. Most tricycles are made with two large wheels, between which is the seat, and a small wheel extending forward, used as a balance and guide. They have been in use since 1878.

TRIEST, *tre est'*, ITALY, until 1918 the chief seaport of Austria-Hungary, is situated on the Gulf of Triest, an arm of the Adriatic Sea, seventy-three miles northeast of Venice and 214 miles southwest of Vienna. The city consists of an old town, with narrow streets, which rise rapidly from the harbor to the heights beyond, and a new quarter, which is built on modern plans. The two parts of the city are separated by a street known as the Corso. Some of the important buildings are the townhall, the Cathedral of San Giusto which occupies the site of a former Roman temple, and the Greek church. There are also a number of ruins of ancient Roman structures, including those of a theatre and an aqueduct. The city has a number of public squares and a public garden. It is one of the most important trade and manufacturing centers on the Adriatic, and has an extensive commerce. Its manufactures include naval stores, machinery, soap, candles, leather and refined petroleum. In the World War Triest was the objective of the Italian drive under General Cadorna, and the Italian army approached within twelve miles of the city. In the adjustment of boundaries after the war the city fell within Italian territory. Population, 1914, 250,500.

TRIGONOMETRY, that branch of mathematics which treats of the measurement of triangles. It follows geometry in a course of study and depends upon certain truths there demonstrated, such as the sum of the angles of a triangle is equal to two right angles; if three parts of a triangle, one of which is a side, are known, the other parts can be found by computation. Trigonometry is divided into two branches, *plane trigonometry* and *spherical trigonometry*, the first named treat-

ing of plane triangles, the second of spherical triangles.

The value of trigonometry in many practical pursuits, such as engineering, surveying and astronomy, is almost inestimable, since it makes possible the measurement of distances and magnitudes which could be measured in no other way, on account of physical obstructions or other conditions. Examples of this use may be found in measuring the distance between two objects on the opposite banks of a stream, without crossing, and measuring the height of a mountain above its base. See MATHEMATICS.

TRILLIUM, or **WAKE ROBIN**, an early spring wild flower, belonging to the lily family, to the other members of which it bears little resemblance. There are various species, but they all are governed, as their name indicates, by the rule of three; the three-sepaled, three-petaled flower rises out of a whorl of three leaves. The painted trillium, with its white petals veined with pink, and the white trillium, or wood lily, are the most beautiful. The purplish red trillium, popularly known as "devil in the bandbox," has a very unpleasant odor.

TRINIDAD, next to Jamaica, the largest and most valuable of the British West Indies, situated off the coast of Venezuela, opposite the northern mouths of the Orinoco. It is about fifty-five miles long and forty miles wide, and its area is 1,754 square miles, a little more than that of the state of Rhode Island. Most of the island is traversed by ranges of hills, covered with forests. The most remarkable natural feature of the island is Pitch Lake, the world's chief source of asphalt. This lake covers ninety acres and yields 190,000 tons of asphalt annually (see ASPHALT). From the lake to Labrae, the nearest port, a road has been built over a bed of asphalt which is moving slowly, glacierlike, toward the sea.

Trinidad is an English crown colony, administered by a governor and a legislative council. Port of Spain, on the northwest coast, is the capital. The population is about 330,000, including Europeans, emigrants from India and negroes.

The island is well watered and has plenty of rainfall. Palms, silk cotton trees, bread-fruit, bamboo, coffee, cacao, bananas and sugar cane are grown. Coffee, cacao, bananas and sugar cane are exported to a considerable extent.

TRINIDAD, COLO., the county seat of Las Animas County, ninety miles south of Pueblo, on the Denver & Rio Grande, the Atchison, Topeka & Santa Fé and the Colorado Southern railroads. The city is in a valley, among the eastern foothills of the Rocky Mountains, southeast of the Spanish Peaks and north of Fisher's Peak. It is surrounded by a farming and sheep and cattle-raising section, and is near extensive coal mines. Railroad shops, coke ovens and wool-scouring plants are located here. Notable buildings are a county courthouse, a Carnegie Library, Saint Joseph's Academy and Saint Raphael's Hospital. Population, 1910, 10,204; in 1917, 14,413 (Federal estimate).

TRINITROTOLUOL, *tri ni tro tol' uol*, popularly known as T. N. T., and one of the most powerful explosives known, is a compound of toluene and nitrogen peroxide. It is a white to pale-yellow solid that melts at 148° F., and is used extensively for the explosive charge of armor-piercing shells, and for torpedoes and mines. Under the influence of mercury fulminate it explodes with incredible violence. It is loaded into shells in a molten state and cooled under pressure. T. N. T. not only explodes with great violence, but in exploding it increases the effect of other explosives present, such as dynamite; for this reason it is used in detonating caps and fuses. A form of fuse made by filling a small lead pipe with molten trinitrotoluol is used when it is desired to explode several charges simultaneously, because the detonating effect will travel through this tube at the rate of 4,000 meters per second. Vast quantities of T. N. T. were used in the World War.

TRINITY, a theological name given to the doctrine which declares the union of the Father, the Son and the Holy Spirit as Three Persons and One God. The doctrine of the Trinity is a development of Christian theology. It is nowhere expressly taught in the Old Testament; however, it is implied in the New Testament. The doctrine was first authoritatively stated at the Council of Nice in 325. The definition of the Trinity generally accepted by orthodox Christians is that there are in the Godhead three persons, who are one in substance, coeternal and equal in power. The term *persons* is not strictly applicable to the Trinity, but something analogous to the conception of personality seems to be implied in the apostolical arguments of the epistles.

TRINITY SUNDAY, the Sunday after Whitsunday. It was definitely established as a Church festival by Pope John XXII in 1334. All the principal festivals occur in the half year between Advent Sunday and Trinity, and all the Sundays from Trinity to Advent are called Sundays after Trinity.

TRIPLE ALLIANCE, an alliance of three powers, a system of diplomacy in vogue in Europe after the close of the Franco-German War, primarily instituted by the German statesman, Bismarck, for the purpose of maintaining balance of power. An alliance was negotiated in 1872 between Germany, Austria and Russia. Conflicting interests in the Balkans prevented this alliance from being a strong one, and when Bismarck retired from office in 1890 William II abandoned the policy of an understanding with Russia, devoting his efforts to the strengthening of a Dual Alliance between Germany and Austria.

The last triple alliance was that effected between Germany, Austria-Hungary and Italy in 1882. This continued, with signs of weakening on the part of Italy, till the outbreak of the World War, when Italy declared neutrality. This neutrality was broken in 1915 by Italy's declaration of war upon Austria. See **WORLD WAR**.

TRIPLE ENTENTE, *ahn tahnt'*, the name popularly applied to the alliance of Great Britain, France and Russia, formed chiefly through the efforts of King Edward VII. The year 1907 saw a series of treaties ratified between these countries, all the treaties having mutual protection of interests as an object. France and Great Britain came to an agreement as to their Mediterranean policy, and largely to Great Britain's influence the French naval power was later concentrated in the Mediterranean, Great Britain practically guaranteeing to protect the northern coast of France against any invaders. Russia and Great Britain also came to the agreement about their policies in Persia, Afghanistan and Tibet, where conflict had sometimes been very near. In a general way the Triple Entente was planned to offset the Triple Alliance (which see), and to maintain the balance of power between the European nations. It was in fulfilment of its agreement with France in this alliance that Great Britain entered the World War against the Central Powers. The Triple Entente and Triple Alliance were set aside by the treaty which ended the World War.

TRIPOLI, an Italian dependency in North Africa, between the Libyan Desert on the east, and Tunis and the Sahara Desert on the west. It has an estimated area of 406,000 square miles. In ancient times Tripoli belonged to the Carthaginians, passing from them to Rome. Later it was captured by the Vandals and Greeks, and in the seventh century by the Arabs (see **BARBARY STATES**). From 1551 till 1911, at which date it was ceded to Italy, Tripoli was a part of the Ottoman Empire, though the sultan rarely exerted much authority over the territory. For much of this period it was the stronghold of piratical bands, whose depredations on the seas caused successive expeditions against Tripoli to be made by England and France. In 1801-05 the United States was at war with Tripoli, and in 1815 an American expedition exacted reparation for injuries done to American commerce. When it passed to Italy in 1911 the Italian government announced that the dependency would be known officially as *Libya Italiana*.

Tripoli has a strip of lowland along the coast, but its altitude rises toward the interior, a large portion of which is a barren plateau. In the southwest is an elevation 3,000 feet above sea level, which forms parts of the mountain range known as Jebel-Nefusa. Beyond this is a low plain, irrigated by wells and cultivated. A fertile portion of the country lies along the Mediterranean, in a strip extending on each side of the city of Tripoli, to a width of about five miles. Wheat, barley, Indian corn and millet are the principal grains grown. The fruits include dates, olives, grapes, pomegranates, lemons, figs, apricots and plums. Melons and garden vegetables are raised. In some sections along the coast, cotton, tobacco, silk, saffron and madder are produced. The summers are hot, though tempered by sea breezes along the coast. The winters are cool, and on the highest mountains snow is sometimes seen. Population, 1911, 523,176 natives (chiefly Berbers), 6,000 Europeans, and numerous Jews.

Tripoli, the capital and principal seaport, is situated on a promontory on the Mediterranean coast. It is a typically Oriental city, with narrow streets and squalid living quarters surrounded by the domes and minarets of Mohammedanism. It is the northern terminus of three important caravan routes across the Sahara, and manufactures carpets,

scarfs and Spanish leather. Trade is mainly in the hands of the Jews. Population, about 75,000.

TRI'EME, a word meaning *three-oared*, was a Greek war vessel of the fifth and fourth centuries B. C., long and light, propelled by three banks of oars and steered by paddles on either side of the stern. A trieme was provided with sails, but these were discarded on going into battle. At Salamis, the great naval battle between the Persians and the Greeks in 480 B. C., the Grecian fleet numbered 380 ships, most of which were triemes.

TRIUMPH, in ancient Roman history, a magnificent procession, the highest military honor awarded a victorious general. It was granted by the Senate only to one who had held the office of dictator, consul or praetor, and then only after a decisive victory or the complete subjugation of a province. The general to whom this honor was awarded entered Rome in a chariot drawn by four horses. He was clad in a flowered tunic and embroidered robe, was crowned with laurel and had a scepter in one hand and a branch of laurel in the other. The Senate and the magistrates, the musicians, the spoils and the captives in fetters formed part of the procession which went before him, and he was followed by his army on foot, in marching order. The procession advanced along the *Via Sacra* to the Capitol, where a bull was sacrificed to Jupiter. Banquets and other entertainments concluded the solemnity. The day was made one of jesting, carnival and license on the part of the soldiery and populace.

A naval triumph was celebrated in much the same manner, but upon a smaller scale and with the use of beaks of ships and other nautical trophies.

TRIUMVIRATE, a political coalition of three men. There were two famous coalitions in Roman history, the first formed in 59 B. C., by Caesar, Pompey and Crassus; the second in 43 B. C., by Anthony, Octavius and Lepidus. The first was illegal, being merely an alliance of powerful individuals. The second was a real triumvirate existing by recognition of the Roman Senate.

TRO'GON, a genus of tropical birds, of which there are about fifty species in both hemispheres, principally in America. Their plumage is soft, full and brilliantly colored, and most species have long, graceful-appearing tails. Their foot structure is peculiar, the first and second toes pointing backward

and the third and fourth forward. Trogons nest in the tops of rotting stumps. Their voices are loud and harsh. The gorgeous Central American trogon known as the *quetzal* was anciently regarded as sacred by the Mayas, and is still the national symbol of Guatemala. See **QUETZAL**.

TRO'JAN WAR. See **TROY**; **MYTHOLOGY**.

TROLLING, *trol'ing*, a method of fishing, in which a spoon hook is dragged at the end of a long line behind a boat. This is a favorite method for bass, pickerel and some sea fish. See **ANGLING**.

TROLLOPE, *tról'up*, ANTHONY (1815-1882), an English novelist, author of *The Warden*, *The Last Chronicle of Barset*, *The Way We Live Now*, *The Claverings*, *Barchester Towers* and other delightful studies of English society of his time. His works are characterized by keenness of insight, realism of detail and an equal command of humor and pathos. He particularly excels in portraits of the clergy and delineation of life in cathedral towns.

TROMBONE, a powerful wind-instrument of the trumpet kind, possessing a complete chromatic scale, like a violin or the human voice. It consists of a tube twice bent, ending in a trumpet-shaped bell, and is sounded by means of a cup-shaped mouth-piece and the manipulation of a slide. Trombones in general use are of three kinds—alto, tenor and bass. Their full rich tones make them favorite instruments in bands and orchestras.

TROMP, MARTIN HARPERTZON (1597-1653), a Dutch admiral, victor over a Spanish fleet off Gravelines in the Straits of Dover in 1639, and over the English fleet under Blake off Goodwin Sands in 1652. The latter victory made the Dutch for a few months supreme in the Channel, but the following spring a new and larger English fleet under Blake, Penn and Monk attacked the Dutch vessels, which were old, poorly-equipped and no match for their adversaries. Tromp, however, retreated with coolness and heroism, bringing 125 merchantmen to safe harbor in Holland. In June of the same year he was killed in another battle with the English.

TROPIC BIRD, or **BOAT'SWAIN**, a sea bird helpless on land but powerful on the wing, often flying hundreds of miles to hover over ships, spending whole days in the air and capturing fish by diving into the water from a great height. Its plumage is white and

satiny, often tinged with pink and variegated by blackish patches. It is distinguished by unusually long wings and two long, willowy, middle tailfeathers. It makes no nest, but deposits its single egg in a hole or crevice in a cliff. Tropic Birds breed in colonies, and male and female incubate in turn.

TROPICS, *trop'iks*, in astronomy, two circles on the celestial sphere, each $23\frac{1}{2}^{\circ}$ distant from the equator. The northern tropic touches the ecliptic at the sign Cancer, and is known as the tropic of *Cancer*; the southern, for a similar reason, is called the tropic of *Capricorn*. The annual path of the sun in the heavens is bounded by these two circles, and when in its journey northward or southward it reaches either of them, it appears to turn back and travel in the opposite direction.

Geographically, the tropics are two parallels of latitude, each $23\frac{1}{2}^{\circ}$ distant from the terrestrial equator. Over these circles the sun is vertical when farthest north, or farthest south, that is, at the solstices. The tropics include between them that portion of the globe called the torrid zone. See **SOLSTICE**.

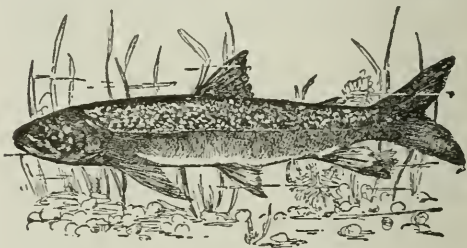
TROTZKY, *trots'ki*, LEON (born 1877), a Russian radical, one of the leaders of the the Bolshevik party that overthrew the Kerensky government in November, 1917. He was a close associate of Nikolai Lenine throughout the period of Bolshevik rule in Russia. Trotzky's real name is LEBER BRONSTEIN. For many years previous to the revolution he had been agitating radical ideas, and from 1905 to 1912 he lived in Siberia as an exile. Subsequently in Berlin, Paris and Spain he attempted to spread his revolutionary ideas, but was suppressed, and finally he went to America, where he would be free to continue his propaganda.

He edited a radical paper entitled the *New World* in New York City, and mingled with Russian agitators on the East Side. When the czar was overthrown Trotzky returned to Russia and joined with Lenine in the movement which established a soviet republic. He was made Minister of Foreign Affairs in the first Bolshevik Cabinet, but later he became Minister of War. To him was entrusted the training of a great revolutionary army to check the factions opposed to Bolshevism and to coerce the ring of small states about Central Russia. This army, numbering more than a million men, was still fighting successfully in the summer of 1919. Trotzky is a

man of ability, an effective writer and a powerful orator. See **RUSSIA**; **LENINE**, **NIKOLAI**.

TROUBADOUR, *troo'ba dohr*, a class of medieval poets first appearing in Provence in the twelfth century, and flourishing for three centuries in Southern France, North Italy and Spain. They were the composers and singers of a species of lyrical poetry, devoted to romantic gallantry and generally very complicated in regard to meter and rhyme. Troubadours wandered from estate to estate and court to court, depending upon the nobles and ladies whom they flattered and entertained to reward their musical and poetic skill. With the fall of the feudal system, of which they were the expression, the troubadours disappeared.

TROUT, *trout*, the common name of a group of fishes belonging to the salmon family and living in streams and fresh-water lakes. The common trout may be found in



LAKE TROUT

Northern Europe and North America, in rivers and lakes and even in small streams. The *speckled brook trout*, most highly prized of food fishes, was formerly found in large numbers in the streams of the New England states, Northern New York, Michigan, Wisconsin and westward, but it was nearly exterminated, except in wild regions or in carefully-guarded streams. Fish commissions have restocked waters of those states, and the angling season for brook trout is now strictly limited by law. There are several species of lake trout in America, among the finest and largest of which is the *Mackinaw trout*. The North American lake trout attains a weight of more than sixty pounds, but specimens of this size are rare. All species of trout are valuable food fish, and laws in many states protect them.

TROUVERE, *troo vair'*, a class of medieval poets of Northern France, corresponding broadly to the *troubadours* of Provence. Though their writings were mainly concerned

with an artificial treatment of the subject of love, they were sometimes of a narrative character and as such made valuable contribution to the development of French literature. See TROUBADOUR.

TROVATORE, IL, *eel tro va tok' rah*. See IL TROVATORE.

TROWBRIDGE, *tro'brij*, JOHN TOWNSEND (1827-1916), an American novelist, poet and writer of stories for boys, author of *Neighbor Jackwood*, a strong protest against slavery, published in 1857, *Cudjo's Cave*, *The Jack Hazard Series*, *My Own Story*, an autobiography full of interesting references to the literature of the latter half of the nineteenth century, and *Vagabonds and Other Poems*. He is also known for his verse, "Darius Green and his Flying Machine," an amusing satire on early attempts to fly.

TROY, or **ILIUM**, an ancient city in the Troad, a territory in the northwest of Asia Minor, south of the western extremity of the Hellespont, rendered famous by Homer's epic of the *Iliad*. There have been various opinions regarding the site of the Homeric city, the most probable of which places ancient Troy at the head of the plain bounded by the modern river Mendereh, supposed to be the Scamander of Homer, and the Dombrek, probably the Homeric Simois. The Ilium of history was founded about 700 B. C. by Aeolic Greeks, and it was regarded as occupying the site of the ancient city. Modern excavations tend to prove the existence of prehistoric Troy, but no one knows whether or not there was a Trojan War. The fascinating story of this legend is told in these volumes in the article MYTHOLOGY.

TROY, N. Y., the county seat of Rensselaer County, 150 miles north of New York City and six miles above Albany, on the east bank of the Hudson River, at the head of navigation and opposite the outlets of the Erie and Champlain canals, and on the Boston & Maine, the Delaware & Hudson, the Rutland and the New York Central railroads. It is the center of several interurban trolley systems. The city stretches along the river on a level alluvial plain for more than six miles, rising to the east on a range of hills about 500 feet, affording a fine residence section. The water front is seven miles long and is occupied by large factories and business houses. Troy is the fourth city industrially in the state of New York, and is fifth in its commerce. Transportation facilities are exceptional, and

the state dam across the Hudson and the falls of two creeks supply water power.

Troy leads in the manufacture of collars, cuffs and shirts, producing between eighty and ninety per cent of all the collars made in America. There is an extensive system of laundries, and the various iron and steel works produce laundry machinery, collar-making machinery, stoves, bells, valves, horseshoes and engineering instruments. There are knitting, paper and flour mills, brickyards and other establishments.

The principal educational institutions are the Emma Willard Seminary for the higher education of women and the Rensselaer Polytechnic Institute. The Hart Memorial Library is a fine structure built in Renaissance style of white marble. There are various charitable institutions, including the Troy and Samaritan hospitals, Marshall Sanitarium, Troy Orphan Asylum, House of the Good Shepherd, a reformatory, the Day Home and several other homes and orphanages. Other important structures are the Federal building; the city hall; the savings bank building, with its music hall; Rensselaer Hotel; Union Passenger Station; Rowe Memorial Building; the Y. M. C. A., and the state armory.

The town was laid out in 1787, and the present name was adopted two years later. It was incorporated as a village in 1794 and was chartered as a city in 1816. During the Revolution the American army encamped on the island at the mouth of the Mohawk River opposite Troy and built earthworks on the north side. During the War of 1812 a certain Samuel Willson, familiarly known as "Uncle Sam," was engaged in packing meat in barrels for the army. The story is told that in reply to an inquiry as to what was meant by the letters U. S., on one of these barrels of meat, the answer was jokingly given, "Uncle Sam." This is one version of the origin of the national nickname. Population, 1910, 76,813; in 1917, 78,094 (Federal estimate).

TROY WEIGHT, a weight chiefly used in weighing gold, silver and articles of jewelry. The troy pound contains 12 ounces; each ounce is divided into 20 pennyweights, and each pennyweight is equal to 24 grains. Hence, the pound contains 5,760 grains, and the ounce, 480 grains. As the avoirdupois pound (the weight in general commercial use) contains 7,000 grains, and the ounce

437½ grains, the troy pound is to the avoirdupois as 144 to 175, and the troy ounce to the avoirdupois, as 192 to 175.

TRUFFLE, *truf'l*, a fungus which grows underground, without visible root. Several species are highly flavored and are used in cookery. The common truffle, found in Central and Southern Europe, grows in loose soils, in woods and in pastures. The size ranges from one inch to several inches. It is black or brown and has a rough, warty surface. Truffles have a strong and pleasing odor, and dogs and pigs are trained to locate them by the scent. These fungi are not found in North America. In normal times about 20,000 pounds are imported from France by the United States.

TRUMBULL, JONATHAN (1710-1785), an American patriot and statesman, born at Lebanon, Conn., and educated at Harvard. He was successively judge, deputy governor and governor (1769-1783) of Connecticut and took a prominent part in forwarding the War of Independence. Washington placed great reliance on him and frequently consulted him. According to tradition Washington called him "Brother Jonathan," and this appellation came to be used as a sort of nickname for the people of the United States.

TRUMBULL, LYMAN (1813-1896), an American jurist and political leader, born at Colchester, Conn. He received an academic education, taught school for a time, and in 1837 was admitted to the bar. He removed to Belleville, Ill., and was elected to the legislature. In 1841 he became secretary of state, and from 1848 to 1853 was a justice of the state supreme court. Two years after the latter date he was elected to the United States Senate and served until 1873, when he moved to Chicago and returned to the practice of law. He began his political career as a Democrat, but joined the Republican party, upheld the administration throughout the Civil War and drafted the Thirteenth Amendment to the Constitution. He returned to the Democratic party after the war and voted in the Senate against the impeachment of President Johnson. In 1894 he joined the Populists, and defended the railroad strike leaders in Chicago in 1894.

TRUMPET, one of the oldest wind-instruments of music. In its modern form it consists of a metal tube (usually brass, sometimes silver), about eight feet long, doubled up in the form of a parabola, and

expanding into a bell-shaped end. The instrument is sounded through a cup-shaped mouthpiece. The trumpet tuned on C produces with great power and brilliancy the following series of tones in an ascending scale: C in the second space of the bass clef, G, C, E, G, B, C, D, E and G.

TRUMPET FLOWER, a climbing plant belonging to the bignonia family, having bright red, trumpet-shaped flowers. In the United States it is found from Illinois to New York, and from the Great Lakes to the Gulf. In the shadowy woods, where it climbs upon the tree trunks, or along the sunny roadside, trailing over bushes and fences, it is a gorgeous spectacle, one of the showiest of the native wild flowers.

TRURO, NOVA SCOTIA, the county town of Colchester County, on the Canadian Government and the Dominion Atlantic railways, and on the Salmon River, about two miles from the head of Cobequid Bay, the easternmost arm of the Bay of Fundy. The manufactures include lasts, pegs, hats and caps, knitted goods, leather, foundry products and condensed milk. The town is noted for its fine public buildings, among which are the county buildings, the provincial, normal and model schools and Truro Academy. Population, 1916, about 7,000.

TRUST COMPANY, a financial organization for the purpose of acting as trustee in settling estates and caring for funds of minors, and in many instances carrying on a savings-bank or even a general banking business. The great advantage possessed by these companies is the fact that they are not, as a rule, required by law to keep a large fixed reserve on hand, whereas the national banks are required to keep at least 15% in smaller cities, and 25% in the larger "reserve cities" such as New York and Chicago. A conservative trust company, of course, will keep a reasonable balance on hand, for the sake of its own safety; but the opportunity to use all its resources when necessary has been of great advantage at times. On the other hand, there has been the temptation to make dishonest use of this privilege, and some of the great companies have suffered from the dishonesty of individuals. A great inducement to depositors has been the fact that the trust companies, with their greater privileges, have been able to offer interest as well as the use of a checking account. The deposits of the trust com-

panies of the country to-day have a total of more than two billion dollars.

TRUSTEE, in law, a person to whom the management of property has been legally committed. A trust may be created by will, by deed or by oral statement, but trusts affecting real estate must be recorded in writing. A person may decline a trusteeship, but having once accepted it may not relinquish it except in cases where it is so provided in the deed or by discharge by a competent court. A trustee must report at stated times to the beneficiaries of the trust as to his care of the funds or property. He is liable for wrongful use or misappropriation of trust funds.

TRUSTS, in the commercial and industrial world, combinations of capitalists engaged in the same or closely-related lines of production or transportation. At first the term was applied to associations formed when the stockholders of the corporations interested transferred their stock to a few men who were chosen trustees. The stockholders received from these trustees certificates of the trust for the stock they deposited, and the management of the business was placed under the control of a few men. The term has now a much broader application.

Why Trusts are Formed. Trusts are the outgrowth of industrial conditions that have arisen since the middle of the nineteenth century. One of the strongest influences leading to their formation is the factory system, which has developed to enormous proportions. In addition to the factory system the following reasons are usually given for the formation of trusts:

1. Commodities can be produced more cheaply on a large scale than in small quantities.
2. Competition leads to such reductions in the selling price that many small factories make no profits, and some run at a loss.
3. Combination reduces expense of distribution. When each factory was working independently several salesmen traversed the same territory. When under the combination one would cover the ground successfully. Moreover, goods can be sold at less expense in large than in small quantities.
4. Combination does away with the duplication of plants and of advertising. A corporation like the United States Steel Corporation, for instance, manufactures a large number of products, such as steel rails, wire, nails, etc. Under one management one plant makes nails; another wire, and a third rails. Were these plants operating independently it is probable that each might find it necessary to

install an equipment for the manufacture of each of these products in order to compete with other mills.

5. The promoter is another important cause. Large commissions are paid the organizer of great corporations, and men who become experts in this line of work often persuade boards of directors to enter into combination with other corporations, when if left to themselves they might not give the proposition favorable consideration. Bankers also obtain large bonuses for underwriting these corporations, and their influence is not slight.

Holding Corporations. It was soon found that the sort of trust described above did not prevent waste to the extent expected. Furthermore, legislation against organizations of this sort as "combinations in restraint of trade" led the stockholders to realize that this kind of trust was not altogether safe. To meet these objections another form of corporation was devised. Under this plan a new company was organized with sufficient capital to buy the controlling interest of the independent companies. The officers of this new company could then control the affairs of each of these subsidiary companies, because they represented a majority of the stock. The Standard Oil Company (which see) and the United States Steel Corporation (which see) were the largest representatives of holding corporations. Under this plan many of the small corporations dissolve after disposing of a majority of their stock to the holding company.

Objections to Trusts. However advantageous the trust may be to capitalists, it has never found favor with a majority of the people in the United States and Canada. The chief objections brought against it are the following:

1. Instead of lowering prices, as would be supposed because of the decreased cost of production, prices have frequently been maintained at their former levels, and sometimes they have been raised.
2. Trusts in former years endeavored to keep wages down.
3. The manipulation of stocks by those in power often causes serious loss to investors.
4. The concentration of wealth in the hands of a few creates an unequal distribution of wealth and corresponding suffering on the part of the poor.
5. "The centralization of the power of industry in a few hands, with its enormous resulting wealth, is undemocratic, and makes the many dependent upon the few."
6. The ideals of democracy and trusts are antagonistic, and the two cannot exist with harmony in a free country.

Sherman Anti-Trust Law. This law, passed by Congress in 1890, is applied to all interstate trade. It declares any combination or conspiracy in restraint of interstate or international trade illegal, and that all such combinations must be dissolved by the United States Courts, upon proof furnished by the Attorney-General of the United States that they have violated the law.

This law has exerted a restraining influence over trusts, and under it some of the most noted combinations have been dissolved. Among these were the Standard Oil Company, the Northern Securities Company, the American Tobacco Company and the International Harvester Company.

TSCHAIKOWSKY, *chi kov'ske*, PETER LYTCH. See TCHAIKOVSKY, PETER LYTCH.

TSET'SE FLY, a biting insect related to the horse fly, found in certain tropical parts of Africa. It bites all warm-blooded animals, often with fatal result. The fly itself is not venomous, but, like the mosquito, carries disease germs which cause *sleeping* sickness in man, and in cattle, horses, and other animals a disease called *nagana*, which is often fatal. Animals not killed by nagana are rendered henceforth immune. The tsetse fly does not lay eggs, but produces full-grown larvae which immediately change into pupae. In limited areas the breeding places of the flies have been destroyed, but no sweeping and systematic plan has yet been undertaken to exterminate the pests.



TSETSE FLY

TUBERCULOSIS, *tu bur ku lo' sis*, the most prevalent of all diseases, is chronic, communicable, infectious, preventable and curable. It has caused, from the most ancient times, directly or indirectly, about one-seventh of all the deaths in the world, but a ray of hope exists in the fact that the disease is now being fought more persistently and more intelligently than ever before.

As the bacillus which causes it is almost always present in the air, it is probable that few people, especially in cities, escape infection. Fortunately, however, unless there is some weakness or predisposition toward the disease the human organism is able to throw off the infection or so to restrict its action that little harm results. Nevertheless, there is no disease whose ravages are so

severe or on which so much study is now being placed by scientists, physicians and all interested in public welfare. In 1882 Koch discovered the cause of tuberculosis, and since that time much has been done to better the condition of consumptives and to restrict the spread of the disease (see GERM THEORY OF DISEASE).

The infectious germ is thrown out of the lungs of a consumptive in the sputum, or spit, and it is not killed by drying. Accordingly, it is taken up by the air in the form of dust, and is carried anywhere and everywhere. It follows that every precaution should be taken to destroy the sputa of consumptives and the discharges from tuberculous sores; for while consumption is in the popular mind a disease of the lungs, yet it may and does affect any part of the body where the bacilli find lodgment. Tuberculosis of the bones, of the stomach and of the intestines is not uncommon. The disease is not confined to human beings, but may affect cattle, chickens, other domestic animals and, especially, wild animals kept in captivity. Any one of these may serve as a means for distributing the infectious germ. No specific has been found for consumption, though many have fraudulently been offered to the public. Doctor Koch's studies led him to advocate the use of a serum, or antitoxin, but it has not proved altogether successful. An open air life, with plenty of exercise, in a dry region not subjected to sudden changes of temperature, will do much to mitigate the severity of the disease, and if this precaution is taken early enough frequently it will effect a cure. See SERUM THERAPY.

TUBERROSE, *tube'roze*, a plant native to Asia and tropical America, inconspicuous in itself, but bearing remarkable flowers. From a tuberous rootstock spring six or eight sword-shaped leaves and a stalk on the end of which is borne a thick cluster of waxen-white, funnel-shaped blossoms, sickeningly sweet. The heavy odor of these blossoms is objectionable to most persons, but the plant is extensively cultivated as a source of perfume.

TUC'SON, *too sahn'*, ARIZ., the metropolis of the state and the county seat of Pima County, 121 miles southeast of Phoenix, on the Santa Cruz river and on the Southern Pacific, the Southern Pacific of Mexico, and the El Paso & Southwestern railroads. The city is located on a wide plateau at an al-

titude of 2,369 feet and has a very dry climate, considered excellent for people with lung and throat troubles. It is the center of one of the richest copper-producing regions in the world, ships two million dollars worth of cattle annually, and is rapidly developing as an agricultural center. Its industries include railroad shops, iron mills, tanneries, and flour, ice, brick and carriage works. The modern part of the city is well built, with attractive residences, good hotels and public buildings, while the old section remains typically Mexican in construction. Tucson is the seat of the University of Arizona and has good public schools, a high school, several sectarian schools, a Presbyterian boarding school for Indians, a Carnegie Library, a Roman Catholic hospital and sanitarium and the Desert Botanical Laboratory, erected by the Carnegie Institution of Washington. Historic Spanish missions and ruins, including the famous San Xavier Mission, make the place of especial interest to tourists. Tucson was first settled about 1776, by the Spaniards, by whom it was known as the Presidio de San Agustin del Tuguison. It was a part of the Gadsden Purchase of 1853, and from 1867 to 1877 was the capital of Arizona territory. The city has grown rapidly since 1900. It has been governed on the city manager plan since 1915. Population, 1910, 13,193; in 1917, 17,324 (Federal estimate).

TUCUMAN, *too koo mahñ'*, or **SAN MIGUEL DE TUCUMAN**, ARGENTINA, situated ninety-four miles northwest of Santiago, near the foot of a mountain range, on the Upper Dulce River. It is connected by railway with Buenos Aires, and has a cathedral, a normal school, a national college and other educational institutions. The industries include trade in live stock and the manufacture of spirituous liquors. Population, 91,216.

TU'DOR, the family name of an English royal line, which reigned from 1485 to 1603. It was founded by Owen Tudor of Wales, who married the widowed queen of Henry V. The first of the Tudor sovereigns was Henry VII; the last was Elizabeth. The reigns of this family were noteworthy for the almost absolute authority exercised. See HENRY VII; HENRY VIII; EDWARD VI; MARY I; ELIZABETH.

TUDOR STYLE, a style of architecture which prevailed in England during the Tudor period, from 1485 to 1603. It was the last

phase of the so-called Perpendicular style, which was a modification of Gothic and was characterized by straight, perpendicular lines. During the reign of Elizabeth, which closed the Tudor period, the residences of the gentry were built with large, square windows, carved staircases, paneled ceilings, numerous fireplaces and chimneys, gables and much ornamental detail.

TUESDAY, *tuzé'day*, the name of the third day of the week, derived from *Tyr*, or *Tiu*, the name of the Norse war god. The French name for Tuesday is *Mardi*, derived from *Mars*, the name of the Roman god of war. *Shrove Tuesday*, the Tuesday before Lent, is so called because it is a day of confession, when shrift is received.

TU'FA, a name applied to a light, porous substance resembling rocks, found about the craters of volcanoes, and to the porous, rock-like formations around mineral springs. While the formation of both is similar, the composition is unlike. Volcanic tufa is cemented ashes; the other is caused by the slow deposition of carbonate of lime and silica. Waters containing carbonate of lime on evaporating leave a deposit known as *calcareous tufa*; those containing a high percentage of silica build up a formation called *siliceous tufa*.

TUFTS COLLEGE, an institution of higher learning at Medford, Mass., founded in 1852 under the auspices of the Universalists. It comprises a college of liberal arts, medical, dental and theological departments, the Jackson College for Women, the Bromfield-Pearson School (preparatory for the engineering department) and the graduate school. The medical and dental colleges are at Boston. It maintains a biological laboratory at South Harpswell, Me., and the Barnum Museum of Natural History, the gift of the late P. T. Barnum, is especially rich in skeletons and mounted skins of animals. There are 300 instructors and over 1,700 students. The library contains over 73,000 volumes.

TUILERIES, *tweel're'*, or *twe'ler'iz*, a royal palace which stood on the right bank of the Seine, in Paris. Catharine de' Medici began the building; Henry IV extended it, and Louis XIV enlarged and completed it. During the Revolution of 1830, the palace was sacked. It was restored to its former splendor by Louis Philippe, but in 1848 it was again pillaged. In 1871 it was almost entirely destroyed by the communists. The

garden of the Tuileries, adjoining the Louvre, is maintained as a public park.

TULANE, *tulane'*, **UNIVERSITY**, an institution of higher learning, located at New Orleans, La. It has an interesting and unique history. It was established in 1847 by the legislature of the state, and continued to receive state support and to be known as the University of Louisiana until 1884. At this time Mr. Paul Tulane gave to administrators appointed by him \$1,000,000, which was to be used for the higher education of the people of Louisiana. Mr. Tulane's administrators decided not to found an independent college or university, but to use the entire income from his bequest for the development and maintenance of the already established University of Louisiana. They did so on condition that the state would forever exempt the property of the Tulane Education Fund from taxation. The state agreed to do this, and in recognition of the munificent gift of Mr. Tulane the institution was given its present name.

Tulane now has productive funds amounting to more than \$4,000,000. The institution has invested, in grounds, buildings and equipment, nearly \$2,500,000. Its medical department is one of the most famous schools of medicine in America. It is affiliated with the state Charity Hospital, one of the great hospitals of the world, which is supported at a cost of \$150,000 annually. Other departments include the colleges of arts and sciences, commerce and business administration, technology, law, dentistry and pharmacy. The institution in all departments has over 300 professors and instructors, and about 2,700 students. The H. Sophie Newcomb Memorial College, the woman's department of the university, has an endowment of \$3,000,000, being the best-endowed college for women in the world. The library contains about 71,000 volumes.

TULIP, a genus of plants embracing about forty species belonging to the lily family, extensively cultivated in gardens. Most of the cultivated varieties are derived from a species introduced into Europe from Asia Minor in the sixteenth century. Tulips may be grown from seeds, but are usually cultivated from bulbs. The crisp leaves and flower stems spring directly from the bulb. The terminal bell-shaped blossoms are without calyx, and may be single or double. They have a wide range of color and some

are fragrant. The coloration is exquisite. Some of the flowers are of uniform tint; others are tints and shades of one color; still others are variegated. The tulip is usually identified with Holland, where it has been most successfully cultivated. There the plants are set out in great fields, and many of the loveliest specimens are produced. The wonderful black and brown tulips originated there.

TULIP TREE, a handsome North American tree of the magnolia family which bears on the ends of the branches yellow tulip-shaped flowers. It is one of the most magnificent of the forest trees of the United States, and next to the plane tree it is the largest of the deciduous trees, growing to a height of 140 feet. It is found from New England to Florida and as far west as Arkansas, and nowhere else; and is known variously as the poplar, whitewood or canoe-wood. The wood is light, compact and fine-grained, and it is employed for various useful purposes.

TULSA, OKLA., the county seat of Tulsa County, 118 miles northeast of Oklahoma City, on the Arkansas River and the Frisco, the Missouri, Kansas & Texas, the Atchison, Topeka & Santa Fé and Arkansas Valley & Western railroads. Tulsa lies in a rich agricultural country, but its rapid growth has been due largely to its proximity to oil and gas fields and coal mines. Its oil district is probably one of the richest in the world. Tulsa has many modern homes, fine business blocks, commodious churches, artistic school buildings and thriving factories. It has refineries, smelters, glass and stove factories and it manufactures car oil tanks. The general offices of some of the large oil companies are located in Tulsa.

Kendall College, a Presbyterian institution, is here. In 1917 Tulsa voted an issue of \$1,750,000 in bonds for highway improve-



COMMON TULIPS

ment in its county. The commission form of government was adopted in 1909. Population, 1910, 18,182; in 1917, 32,507 (Federal estimate).

TUMBLEWEED, the popular name of several North American plants. They are of low, bunchy growth, and in the fall when dry and crisp, they become more or less ball-like, break from the stem and are rolled about over the ground by the wind. This is nature's way of distributing the seeds; the plant is a nuisance to farmers.

TUMOR, *tu'mur*, a surgical term, which in its widest sense means a swelling of any part of the body; more strictly, however, it implies a permanent enlargement, occasioned by a new growth, and not a mere increase in size of a natural part. Tumors may be considered in two well-defined classes, *simple*, benign, or innocent, tumors, and *malignant* tumors. The substance of tumors of the first class resembles some of the tissues of the body; they increase gradually in size, produce little inconvenience, except that which is occasioned by their size, and may be completely cured by a simple surgical operation. Malignant tumors usually terminate fatally.

TUNA, or **TUNNY**, *tu'ni*, the name of the largest fish of the mackerel family. It is also called the *horse mackerel* and the great *albacore*. The body is thicker than that of the mackerel, and the tail is deeply forked. The largest specimens attain a length of ten feet and weigh 1,500 pounds, but fish of this size are seldom found. Tuna inhabit all warm seas. The flesh, even of the largest fish, is good, and tuna fisheries constitute an important industry in Southern Europe, and in Southern California around Catalina Island, where the fish are found in large numbers. Most of the California catch is canned. The flesh has a slight chicken flavor, and from this characteristic the tuna is sometimes called the *chicken of the sea*. The tuna is a gamey fish, and taking it with hook and line is rare sport for anglers.

TUNDRA, *toon'dra*, the name applied to the vast swampy plains bordering on the Arctic Ocean in Europe, Asia and North America. In summer the ground thaws to a depth of a foot and a half or two feet, and then the tundra becomes covered with a dense growth of flat moss and is sprinkled with wild flowers. In this season it is visited by birds and fur-coated animals. These vast tracts can be crossed only in winter.

TUNGSTEN, a heavy metal, discovered in 1781. It has a grayish-white color and considerable luster. It is brittle, nearly as hard as steel, and less fusible than manganese. The ores of this metal are the native tungstate of lime and the tungstate of iron and manganese, which latter is also known as *wolfram*. It is now very popular as a filament for incandescent electric light globes. See **ELECTRIC LIGHT**.

TUNIC, an ancient form of garment, in constant use among the Greeks and Romans. It was worn by both sexes, under the *toga* or the *stola*, and was fastened by a girdle or belt about the waist. The word is popularly applied to any long, loose garment hung from the shoulder and caught at the waist by a belt.

TUNING FORK, a steel instrument, with two prongs, which, when set in vibration, give forth a musical sound of a certain fixed pitch. The ordinary tuning fork sounds only one note, usually the middle, or tenor, C, or the A below it. Some tuning forks are made with a slider on each prong, by means of which a number of notes may be produced.

TUNIS, a French protectorate in Northern Africa, lying between Tripoli and Algeria and bounded on the north and east by the Mediterranean Sea. It has an area of 45,000 square miles, divided into a fertile plateau in the northern part and a continuation of the Sahara Desert in the south. The plateau region is well watered and produces profitable crops of wheat, barley, oats, olives, citrus fruits and grapes. The climate is healthful, and there are many European colonists who have greatly improved the methods of agriculture and means of transit. The oases of the desert regions yield a large output of dates. Stock raising and mining are important industries, the principal mineral products being zinc, lead, iron, salt and phosphates. There are few industries except the household industries of the natives, who make carpets, saddles and other leather articles and woolen goods. The fisheries yield sardines, tunny and sponges.

Tunis in ancient times was successively a part of Carthaginian, Roman and Vandal dominions. The Arabs in the seventh century and the Ottoman Empire in the sixteenth gained domination over the territory. In 1881 France, to punish raids upon Algeria, sent an expedition into Tunis, at the same time stationing a squadron in the harbor.

After subduing an outbreak on the part of the natives, it established a protectorate over the little country.

TUNNEL, an underground passage cut through a hill, a rock or any eminence, or cut under a river or a town, to carry a canal, a road or a railway. In the construction of canals and railways, tunnels are frequently excavated, in order to preserve the desired level and for various other local causes. Tunnels, when not pierced through solid rock, have usually an arched roof and are lined with brickwork or masonry. The sectional form of the passage is various. Among the greatest works of this kind are the tunnels of Saint Gotthard, Mount Cenis, the Arlberg and the Simplon. In America the Hoosac Tunnel, the Cascade Tunnel in Washington and those constructed under the Hudson and East rivers by the Pennsylvania railroad, to provide a means of entrance for its trains into New York City, are the most important. The two Pennsylvania tunnels under the Hudson River from Weehawken to New York have an inside diameter of 21 feet 2 inches, and a length under water of 6,118 feet. These tunnels were completed in 1910. All are really tubes made of iron or steel rings, with an average thickness of sixteen to twenty inches.

TUNNY, the largest species of mackerel. These fish live in shoals in almost all the seas of the warmer and temperate parts of the earth. They are taken in immense quantities on the Mediterranean coasts, where the fishing is chiefly carried on. The flesh, which is delicate and somewhat resembles veal, has been highly valued since ancient times. The common tunny attains a length of ten feet and sometimes exceeds half a ton in weight. Its color is a dark blue on the upper parts and silvery white below. The American tunny is found on the coast from New York to Nova Scotia, and also in the Pacific Ocean off Santa Catalina, where it is known as the tuna. See **MACKEREL**.

TUPPER, CHARLES, Sir (1821-1915), a Canadian statesman, was born at Amherst, Nova Scotia, and educated at Horton Academy and Edinburgh University, where he studied medicine. Returning to Nova Scotia to practice his profession. He entered public life as a Conservative member for Cumberland County in the provincial assembly. From 1857 to 1860 he was provincial secretary and from 1863 to 1867 he was premier.

In discussions preceding Confederation Sir Charles took a leading part. He declined office in the first Dominion Cabinet, but in 1870 accepted the presidency of the Privy Council, later becoming Minister of Inland Revenue and then Minister of Customs. From 1873 to 1878 he continued to serve in the House of Commons and in 1878, in Sir John Macdonald's second ministry, became in turn Minister of Public Works and Minister of Railways and Canals. Sir



SIR CHARLES
TUPPER

Charles was prominent in support of the Canadian Pacific Railway and in 1887, as finance Minister, he floated a large loan on its behalf. From 1884 to 1887, and again from 1888 to 1896, he was Canada's high commissioner in London. In April, 1896, he succeeded Sir Mackenzie Bowell as Premier of Canada, but at the general elections in June the Conservatives were defeated. Sir Charles continued to lead his party in the House of Commons until 1900, when he was defeated for reelection and retired to private life. (For portrait, see **PREMIER**).

TURANIAN, a term formerly applied to all Asiatic languages which were neither Aryan nor Semitic, but which to-day has little scientific usage. The group of related languages of Europe, Asia (except China) and Oceania, which are neither Aryan nor Semitic, are now designated respectively as Ural-Altaic or Finno-Ugric, Dravidian, Kolarian, Tibeto-Burman, Khasi, Malayo-Polynesian, Mon-Anam and Tai.

TURBAN, a form of headdress worn by

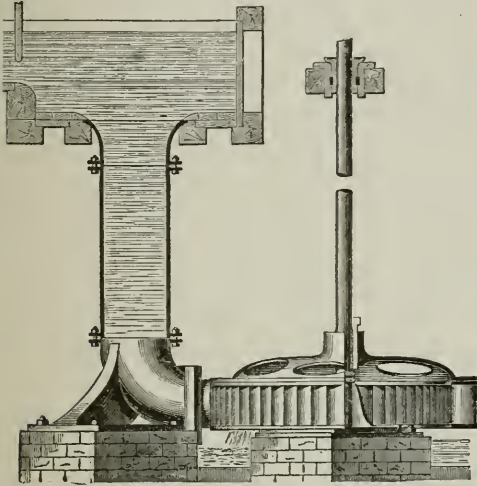


TURBANS

Oriental. It varies in form and color in different nations and among different classes of the same nation, but usually it is a scarf

folded around the top of the head or over a cap. In India priests customarily wear white turbans; those of high rank wear brightly colored ones. Until comparatively recent times turbans made of handana handkerchiefs were generally worn by negro women in the Southern states.

TURBINE, *tur'bin*, a waterwheel which the water enters and leaves at all points on its circumference. The turbine wheel is enclosed in a close-fitting iron box and is usually attached to a vertical shaft. It operates on the principle of the Barker's mill (which see). The circumference of the wheel is provided with floats, all of which point in the same direction. The sides of the box in which the wheel is enclosed are called par-

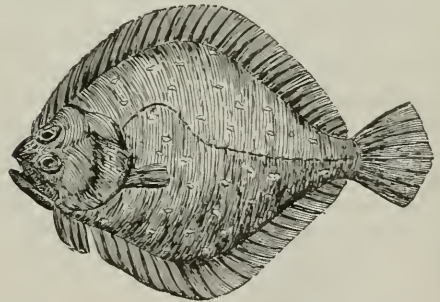


TURBINE WHEEL

titions and in number are equal to the floats of the wheel; they point in the opposite direction. The water is admitted to the box through a vertical or oblique iron pipe, called the *penstock*. The wheel is placed at the lowest possible point, since the power exerted depends upon the pressure of the water. When the water flows through the box, the floats on the edges give it a direction opposite to that in which the floats on the wheel point. As the current of water strikes these floats they tend to turn it in the opposite direction, and the reaction upon the floats causes the wheel to revolve. The size of turbines varies from a few inches to eighteen feet in diameter. The turbine is the most powerful waterwheel in use, as it utilizes ninety per cent of the power employed. The largest are at Niagara Falls and Keokuk.

Steam Turbine. The steam turbine is a form of motor which uses the expansive force of steam to produce motion, by bringing the steam in contact with floats on an axis, similar to the floats of an ordinary water turbine. The steam turbine is enclosed in a steel case, which has veins between the floats extending inward almost to the axis. The veins and floats are curved in opposite directions, so that the current of steam is reversed as it comes in contact with them, and the reaction caused by this reversal of the current forces the floats along and causes the axis to rotate. The steam turbine is really several turbines attached to the same axis, each succeeding one having a slightly larger diameter, in order to adapt it to the pressure of the expanding steam. Steam turbines are used for power upon steamships, where they have taken the place of the common steam engine very satisfactorily. The first steamer equipped with this form of motor crossed the Atlantic early in the spring of 1905. The use of the turbine relieves the ship from the strain arising from the action of an ordinary engine and also enables the vessel to maintain a more uniform rate of speed. Steam turbines are also employed in operating large dynamos where water power is not available.

TURBOT, the most valuable of all flatfish. It is shorter and broader than most flatfish and sometimes weighs nearly a hundred pounds, though the average weight is twenty pounds. The upper surface is brown and studded with tubercles. These fish live in the ocean depths along the banks. The



TURBOT

eggs—from five million to ten million to a fish—float upon the surface. The American *spotted turbot* is common on the North Atlantic coast, and is one of the most highly valued of food fishes.

TURGENIEFF, *toor gan'e'yef*, IVAN SERGEYEVITCH (1818-1883), one of the foremost of Russian novelists. He was born at Orel, the son of a wealthy nobleman, and was educated at Moscow, Saint Petersburg (Petrograd) and Berlin. He came to an open rupture with his mother because of her treatment of the serfs, and had to secure a government clerkship for support. When his mother died he immediately freed all the serfs belonging to the family estate. His *Annals of a Sportsman*, describing the ill-treatment of the peasants, was eagerly read by the heir apparent to the throne, Alexander II, and it had much to do with the freeing of the nation's serfs. Almost all of his subsequent writing dealt with social conditions in Russia. *Nobles' Nest* shows the pitiable contrast between the life of the aristocratic class and that of the laborers. *Fathers and Sons*, *Virgin Soil* and *Smoke* are in the same realistic vein and place Turgenieff in the rank of the greatest masters of fiction. All of them, together with *On the Eve*, one of his earlier novels, have been translated in English.

TURIN, ITALY, capital of the province of Turin, is situated on the River Po, at its confluence with the Dora Riparia, seventy-six miles southwest of Milan. It occupies a beautiful site in the midst of a plain surrounded by mountains, and is one of the most attractive towns in the north of Italy. The streets cross each other at right angles, and the city's activities center at the Piazza Castello, on which are the Madama Palace, an old castle built in the Middle Ages, and a royal palace, which dates from the middle of the seventeenth century. Other buildings of interest are the cathedral, dating from the fifteenth century; the Church of San Domenico, dating from the fourteenth century, and the Royal Burial Church, located on a hill east of the city. A building known as the Mole Antonelliana, resembling a tower and surmounted by a gilded statue 538 feet above the ground, was erected to the memory of Victor Emmanuel II and is used as a museum.

The University of Turin, founded in 1405, is located here; also a royal polytechnic school, military schools and a national library with 350,000 volumes. Turin is an important city, industrially and commercially. Its manufactures include silks, lace, velvet, ribbons, cotton and woolen goods, machinery,

iron and steel products, porcelain ware, musical instruments, jewelry and chocolate. It was the capital of Italy from 1861 to 1865. Population, 1911, 427,106; in 1915, estimated at 451,994.

TURKESTAN, *toor ke stan'*, a large area in the interior of Asia, extending to Siberia and Mongolia on the north, to the Gobi Desert on the east, to Tibet, India and Bokhara on the south, and to the Caspian Sea on the west, with somewhat indefinite boundaries. The region is divided politically into Eastern, or Chinese, Turkestan, and Western, or Russian, Turkestan.

Chinese Turkestan. This region, which is a dependency of China, covers an area of 550,350 square miles and has a population of mixed Turkish and Aryan descent, estimated at 1,200,000. The climate is severe and extremely dry, the oases and strips at the foot of the mountain ranges being the only parts permanently habitable. The chief products are wheat, millet, oil-seeds and cotton. Hemp, flax and dye plants are raised, and grapes, melons, pomegranates and some other fruits ripen. The mulberry tree thrives, and considerable silk is produced. Stock raising is the chief industry, and large herds of horses, camels, sheep and cattle are raised, many of which are exported.

The great caravan route from Peking to Siberia passes through this country, following a line of oases.

Russian Turkestan. This region includes the territories of Samarkand, Ferghana, Sirdarya and Semiryetehensk, extending west from Eastern Turkestan to the Aral Sea and the Caspian. The population of over 5,000,000, is made up of Turkomans, Kirghizes and Russians. The eastern portion is high, and the surrounding mountains are crowned with perpetual snow; but toward the west the surface descends rapidly, until at the Caspian Sea it is eighty feet below the Mediterranean. The climate is subject to extremes of heat and cold. During the rainy season the surface is covered with a growth of vegetation, which reaches maturity rapidly.

Wheat, barley, rice, sugar cane, melons and garden vegetables, as well as fruits of various sorts, are raised in paying quantities wherever water can be obtained. The country is traversed by a number of caravan routes, and the Trans-Caspian railway connects the important towns with one another and with centers of trade in Russia.

